THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXVIII. No. 1745.] LONDON, OCTOBER 20, 1896. [48TH YEAR. PRICE 6d.

TUBES AND FITTINGS
FOR
GAS, STEAM, WATER,
AND ALL PURPOSES,
ALSO
COILS OF EVERY SIZE AND SHAPE.

Apply to the Original Firm of
JOHN BROTHERTON
LIMITED,
Imperial Tube Works, Monmore Green,
WOLVERHAMPTON.
ESTABLISHED 1861.

Lanemark Coal Co.,
LIMITED.
LANEMARK CANNEL AND GAS COALS.
Quotations and Analysis on Application to
LANEMARK COLLIERY,
NEW CUMNOCK, N.B.
Shipping Ports: All the principal Scotch Ports.

— ESTABLISHED 1830. —
PARKER & LESTER,
Manufacturers & Contractors.
THE ONLY MAKERS OF
PATENT ANTIMONY PAINT,
Parker's Imperial Black Varnish,
Oxide Paints, Oils, and General Stores for Gas and Water Works.
WORKS:
ORMSIDE STREET, OLD KENT ROAD,
LONDON.

ROBERT MARSHALL,
CANNEL COAL MERCHANT,
97, WELLINGTON STREET, GLASGOW.
Prices and Analysis of all the Scotch Cannels on Application.

NORTON'S PATENT
"ABYSSINIAN" & ARTESIAN TUBE WELLS,
FOR TOWN WATER-WORKS AND OTHER SUPPLIES.
The following Town Water-Works Supplies have been obtained by this System, viz.:—Abbott's Langley, Aldershot, Alnwick, Cirencester, Hertford, Lechlade, St. Albans, Shrewsbury, Skegness, Southampton, Stony Stratford, Swansea, Wallingford, Watford, West Worthing, Wimborne, &c.
LE GRAND & SUTCLIFF,
HYDRAULIC ENGINEERS, 100, BUNHILL ROW, LONDON, E.C.

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MANY HUNDREDS WORKING AT GAS-WORKS.
Write for Catalogue—
MELDRUM BROS., ATLANTIC WORKS, MANCHESTER.
Also at LONDON, LEEDS, NEWCASTLE, LIVERPOOL, and BIRMINGHAM.

DANIEL HOWARD,

(Successor to the late BENJ. WHITEHOUSE),

GASHOLDER & BOILER WORKS,

WEST BROMWICH, NEAR BIRMINGHAM

(ESTABLISHED 1765).

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WROUGHT AND CAST IRON TANKS FOR DITTO,

PURIFIERS, CONDENSERS, SCRUBBERS, HYDRAULIC MAINS, and all kinds of GAS APPARATUS,

Wrought-Iron Roofs, Bridges, Girders, &c.,

Steam, Hot Water, and Range Boilers, Tanks, Cisterns, Boats, and all kinds of Wrought-Iron Work.

DRAWINGS, SPECIFICATIONS, AND ESTIMATES SUPPLIED ON APPLICATION.

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ENGINEERS & CONTRACTORS FOR GAS-WORKS.

TELEGRAPHIC ADDRESS: "COCKEYS FROME."

THE IRON-WORKS, FROME.

Messrs. COCKEY desire to draw the attention of Gas Engineers and Managers to their new form of GAS WASHER, which, by a recent patent, converts their HORIZONTAL Washer into one of a VERTICAL form.

The principle is the same as in the horizontal one, which has now been before the profession for a number of years, and where adopted is giving unqualified satisfaction.

The Washer is entirely automatic in its action, and does not therefore need any motive power—an advantage which will be apparent to all.

It is made in all sizes, from 25,000 TO 3,000,000 FEET PER DAY; and Messrs. COCKEY invite inquiries, which shall have early attention.

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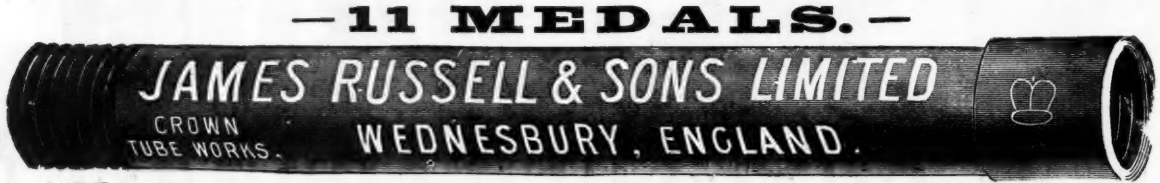

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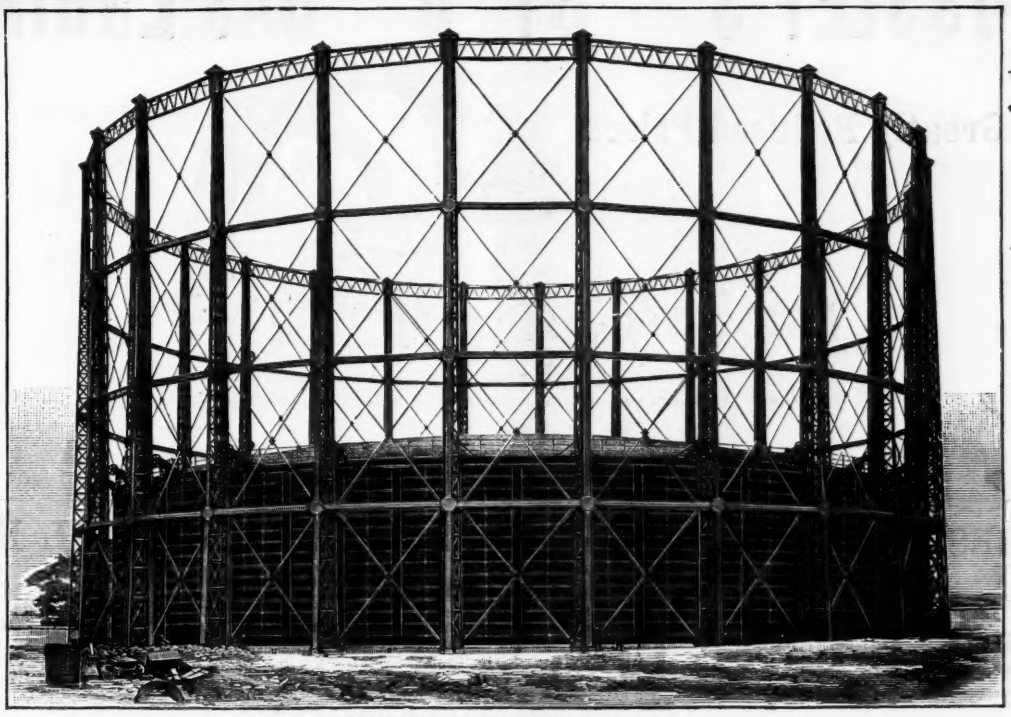

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All Particulars from Patentees: 9, VICTORIA STREET, LONDON, S.W.

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REAL OLD SILKSTONE GAS COAL,

Address THE STRAFFORD COLLIERIES COMPANY,

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MANUFACTURERS OF

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WITH RACK & PINION
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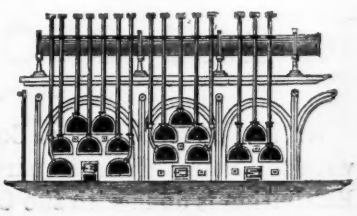

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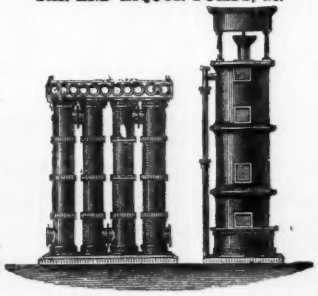

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for working Purifiers,

Also Bye-Pass & Stop Valves.

PURIFIERS with Planed Joints,

HAND and HYDRAULIC LIFTING GEAR, CAST-IRON MAINS, and SPECIALS.

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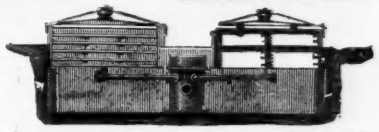

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GAS COAL FAMOUS FOR ITS UNRIVALLED EXCELLENCE.

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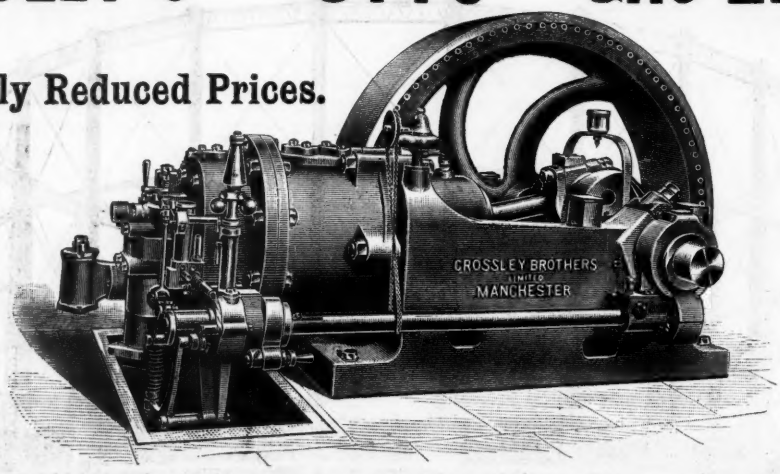
Greatly Reduced Prices.



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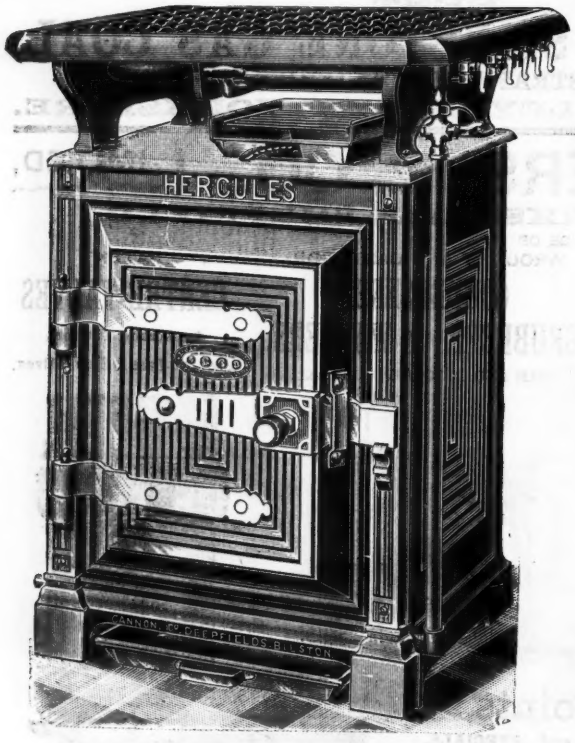

The LUNCHEON

OF H.R.H. THE

PRINCE OF WALES,

WHEN HE VISITED THE

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WAS PREPARED ON ONE OF THE

"HERCULES"

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N.B.—The whole of the Cooking in connection with the Refreshment Departments of the Cardiff Exhibition is done with the CANNON 'HERCULES' GAS-COOKERS.

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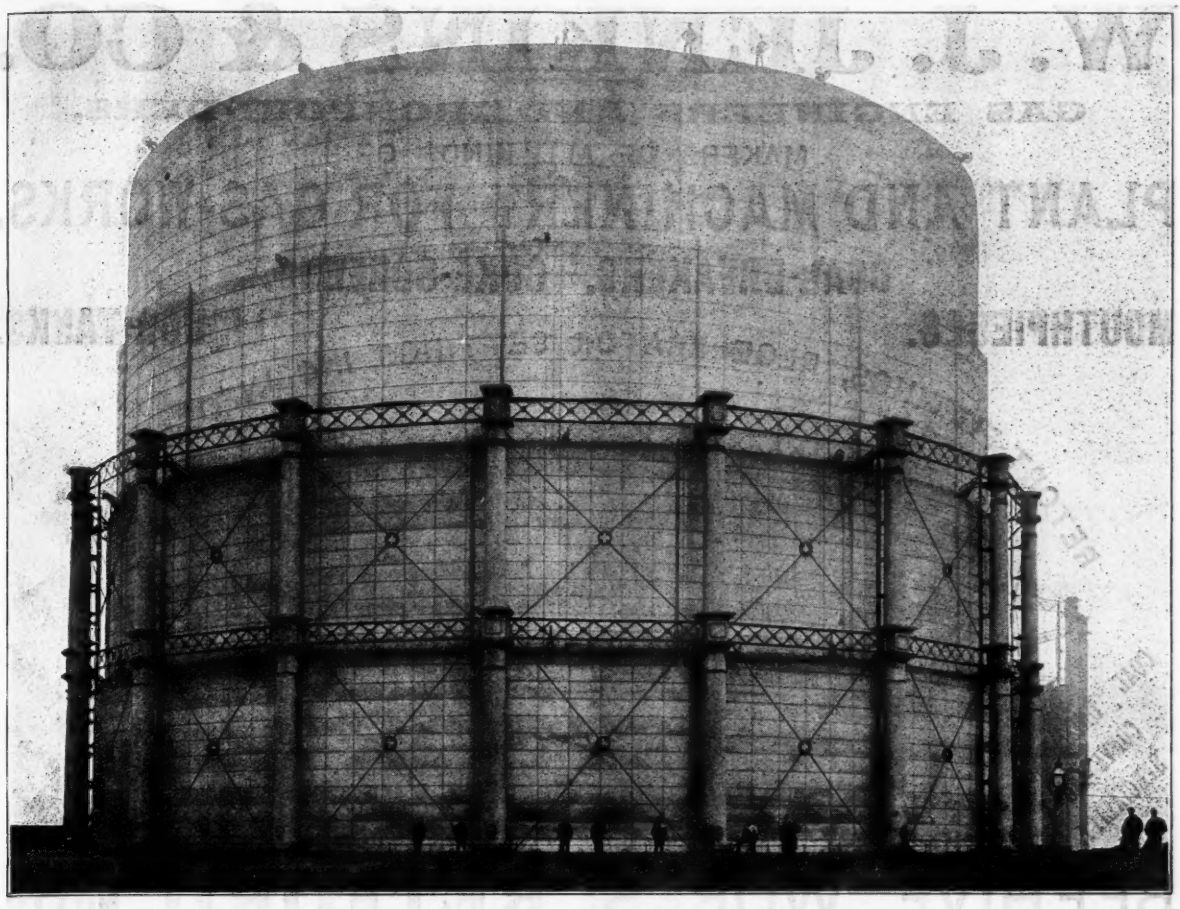

BIRKENHEAD GASHOLDER, FOUR LIFTS

(160 FEET DIAMETER, EACH 80 FEET DEEP).

The **TWO INNER LIFTS** were added on the **ROPE SYSTEM.**
The **THIRD LIFT** is controlled by **ROPES**, as well as by Columns.

EXTRACT FROM THE ENGINEER'S REPORT, FEBRUARY 11, 1896.

"During a great gale on October 2nd, the holder was at its greatest height (120 feet); and I can safely say it was the steadiest holder on the works. In fact, throughout the whole of October, we experienced exceptionally heavy weather; and, of course, the holder during that time was tested in all positions, but with the same unvarying steadiness.

(Signed) T. O. PATERSON, Engineer."

THE HOLDERS in which the ROPE SYSTEM has been adopted have a capacity of 15,200,000 cubic feet.

ASHMORE, BENSON, PEASE, & CO., LTD., Stockton-on-Tees.

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Manufacture & supply best quality of

Gas Retorts (SEGMENTAL, HORIZONTAL, or INCLINED.)

Special Bricks & Blocks for GENERATOR & REGENERATOR FURNACES.

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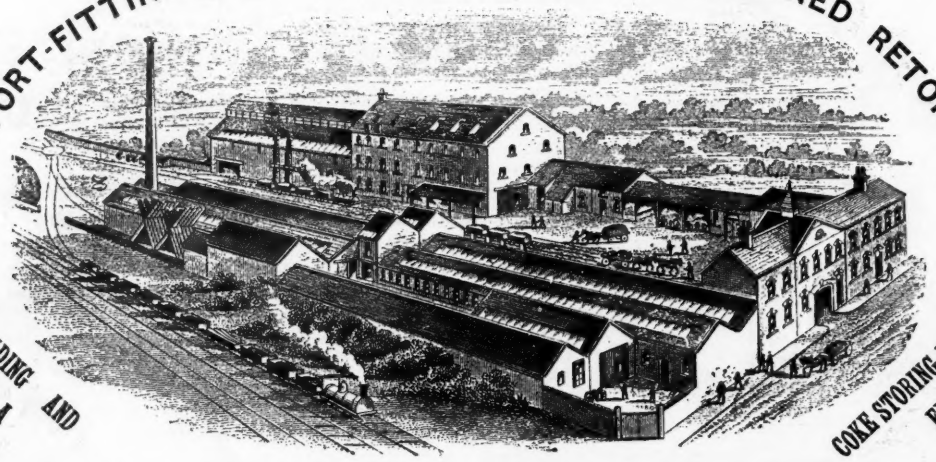

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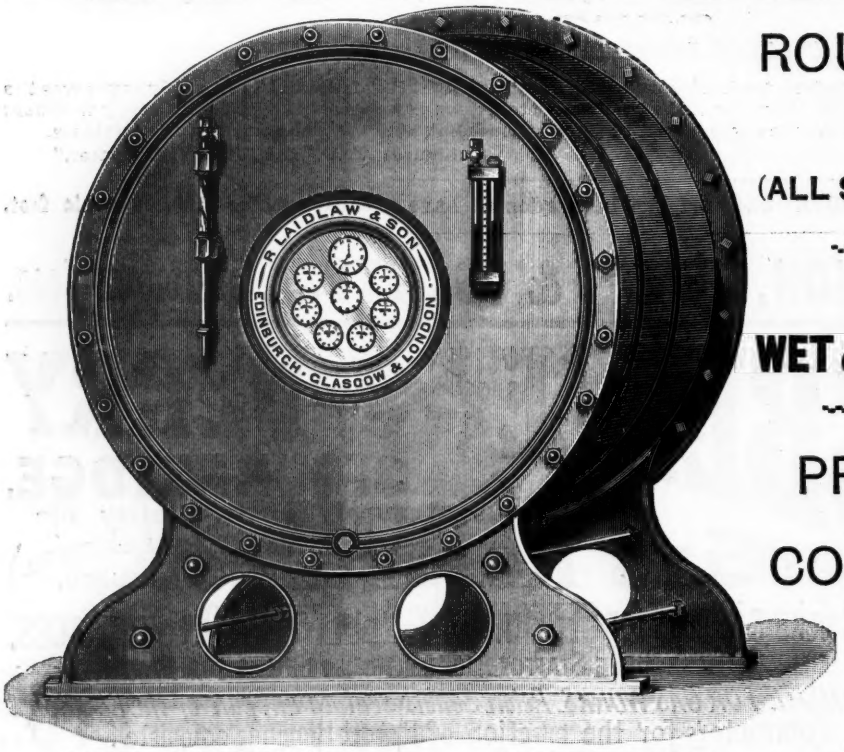

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CONSUMERS'

WET & DRY GAS-METERS.

PREPAYMENT AND COMPENSATING METERS.

SIMON SQUARE WORKS, **EDINBURGH.** | ALLIANCE FOUNDRY, **GLASGOW.** | 6, LITTLE BUSH LANE, **LONDON, E.C.**

INCANDESCENT GAS-LIGHT

(WELSBACH PATENTS).

Important Notice.

Large Reduction in Prices
From March 2, 1896,
Due to Colossal Sales,
And Universal Adoption of the System.

THE GREATLY REDUCED CONSUMPTION OF GAS
Covers the Initial Cost of the Burners in less than SIX Months.

The Prices have been REDUCED as follows:—

The Ordinary "C" Burner, price 6/6
The "C" Bye-Pass Burner, „ 7/6

Prices of other Patterns Reduced Proportionately.

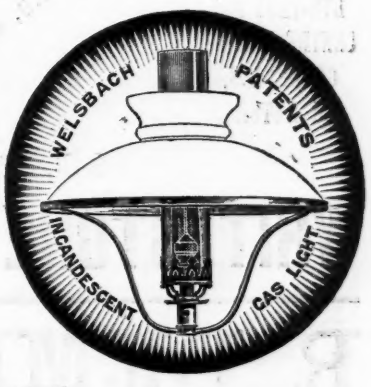
Special attention is called to

The "S" Bye-Pass Burner, price 7/6

which, with a consumption of 2¼ cubic feet of gas an hour, gives

A LIGHT OF 25 TO 30 CANDLE POWER.

This pattern is particularly recommended where it is desired to effect a large saving in gas rather than to effect a great increase in the light.



The attention of Gas Managers and Gas Engineers is called to this System of Lighting as one which tends to Popularize the Use of Gas as an Illuminant, owing to the following advantages:—

Economy in Consumption of Gas, combined with High Illuminating Efficiency.
Freedom from Smoke, Dirt, and Flickering.
Greatly Reduced Heat.
The combination of High Lighting Power with DURABILITY can only be obtained by The Welsbach System.

The "Lancet" Special Analytical and Sanitary Commission, in an exhaustive report, pronounces the "Incandescent Gas-Light System" to be the Healthiest, Best, and most Economical System of Gas Lighting.

Suitable for every purpose of Inside and Outside Lighting.

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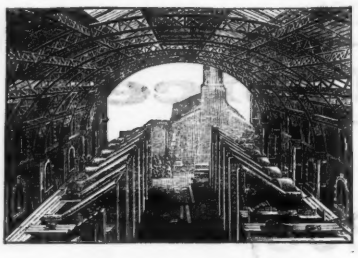

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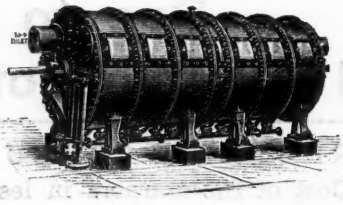
PLANT.

Telegrams:
"HOLMES, HUDDERSFIELD."

Improved
PATENT SCRUBBER-WASHERS,
All sizes,
From 50,000 to 5,000,000 Cubic Feet of Gas per day.
Results unrivalled. Send for Particulars and Prices.

MALLEABLE
and all Kinds of
CASTINGS.



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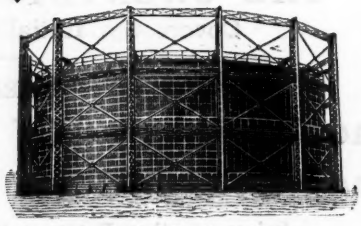
ROOFS, BRIDGES, TANKS, GIRDERS.



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BYE-PASS and
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Rotary or Pump
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GENERATOR & REGENERATOR FURNACES & SETTINGS

GIVING VERY BEST RESULTS.

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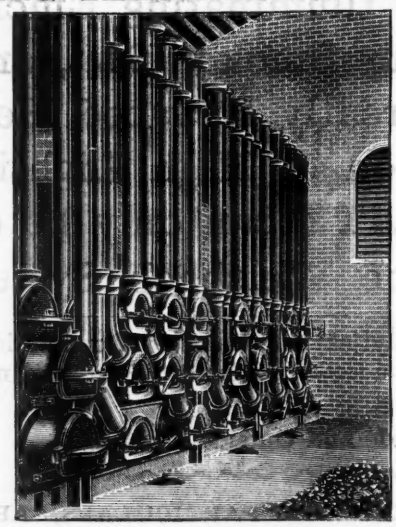
This COMPANY write—

"Mr. Chester's Furnaces and Settings you have erected for us work exceedingly well. Splendid heats under easy control. Nearly 50 per cent. less Coke used for Fuel than formerly. Very convenient for Sunday stopping. Work done in a thorough manner, to our entire satisfaction."



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Mr. LISTER writes that—

"The result of using Chester's Furnace and Setting for first Six Months of 1896 was to produce 26,000 cubic feet more gas, using 35 tons less coal, and having 171 tons more coke for sale, compared with same period of 1895."

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"Can make 8000 to 9000 per mouthpiece easily with **Mr. Chester's Regenerators** you have erected for us. Fuel Consumption much less than with our Generators. Heating of Retorts very even. Very well pleased with working. Results exceed expectations."

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Established 1790.

MANUFACTURERS OF EVERY DESCRIPTION OF GAS PLANT,

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TO

GASHOLDERS

FOR WHICH THEY HAVE THE NEWEST AND MOST MODERN MACHINERY.

GASHOLDERS CAN BE MADE OF ANY DIAMETER AND PUT TOGETHER AT THE WORKS.

Holders having a capacity of **8,000,000** Cubic Feet have been made and erected; the largest one being 181 feet diameter by 136 feet 9 inches deep. Riveted entirely with ⅞-inch diameter Hot Rivets.

WE ERECT GASHOLDERS EITHER WITH OR WITHOUT FRAMING.

NO ROYALTIES TO PAY FOR PATENTS.

SOLE MAKERS OF

COATES' IMPROVED PATENT FURNACE DOOR PROTECTOR,

Which has been approved and adopted by the Gas Authorities at

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CUTLERS PATENT TUBULAR GAS CONDENSER SUITABLE FOR GASWORKS OF ALL SIZES, AND FOR ANY CLIMATE OVER 100 ERECTED

MAKERS OF GASHOLDERS OF EVERY SIZE AND TYPE

HUNT'S PATENT WASHER. IS THE ONLY APPARATUS NECESSARY BETWEEN THE CONDENSER & PURIFIERS. IT REQUIRES NO MOTIVE POWER

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A SPECIALTY STEEL TANKS FOR GASHOLDERS AND OIL STORAGE.

IMPROVED SYSTEM OF CARBURETTED WATER-GAS PLANT PARTICULARS ON APPLICATION.

CUTLER'S FREEZING PREVENTER IS THE BEST APPLIANCE FOR PREVENTING FORMATION OF ICE IN GASHOLDER CUPS. IT IS IN USE AT MANY IMPORTANT WORKS IN ENGLAND, GERMANY, AUSTRIA, AND AMERICA

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DYNAMOS MOTORS.

KIRKHAM, HULETT, & CHANDLER, Ld.

3 & 4, PALACE CHAMBERS, BRIDGE STREET, WESTMINSTER, S.W.

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"STANDARD" WASHER-SCRUBBERS

☛ 505 in use, and several in course of construction. Maximum Washing Surface. Minimum Back-Pressure and Power required to drive. Efficiency Guaranteed.

MARSHALL'S PATENT
TAR-EXTRACTOR.
Extracts all the Tar without choking up.

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WATER-SOFTENER.
Prevents all "Scale," and saves Fuel, &c.

BURMEISTER & WAIN'S
TAR-SEPARATOR.
Extracts over 99 p.c. of Ammoniacal Liquor from Tar.

FOR OTHER SPECIALITIES, SEE LAST AND NEXT WEEK'S ISSUE.

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FOR ENRICHING GAS IN BULK.

Over 50 Maxim Patent Carburettors have now been fixed, capable of enriching

650,000,000

CUBIC FEET OF GAS PER DAY.

Among the Companies supplied are The Gaslight and Coke Company, the South Metropolitan Gas Company, Birmingham Corporation, Manchester Corporation, Rochdale Corporation, Bristol Gas Company, and many other Works, both large and small, where they have been working in some instances for the past **FOUR YEARS.**

More Gas and saleable Coke per ton of Coal Carbonized is produced; saving Capital, Labour, Fuel, Wear and Tear, &c.

The Enrichment is **INSTANTANEOUS** and **PERMANENT.**

The Carburettor is inexpensive, easily fixed, and entirely supersedes the use of Cannel.

SOLE AGENTS FOR REDWOOD & CLOWES' INFLAMMABLE VAPOUR & GAS DETECTORS.

Dealers in Carburine and all other Naphthas for the Enrichment of Gas.

FOR PRICES AND FULL PARTICULARS, APPLY TO

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ARDEN HILL & CO.,

GAS ENGINEERS,

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No. 1080.

"THE ERA."

(Registered.)

A New Fire, with Circular Front, for this Season.

Has a perfect arrangement to utilize all Products of Combustion.

SPECIALLY MADE FOR HIRING-OUT PURPOSES.

No.	Height. Inches.	Width. Inches.	Width of Fire. Inches.	Price, Best Stove Enamel.
1080	20	20	8½	50s.
1082	30½	22½	10	60s.
1084	31½	25½	13	70s.

NOTE.—Prices include New Duplex Burner, Two Brass Lever Taps, and Fittings all complete, which can be had either right or left hand.

NICKEL PLATED TRIVETS . . . . . 2s. EXTRA.

THE GAS-METER COMPANY, LIMITED

MANUFACTURERS OF

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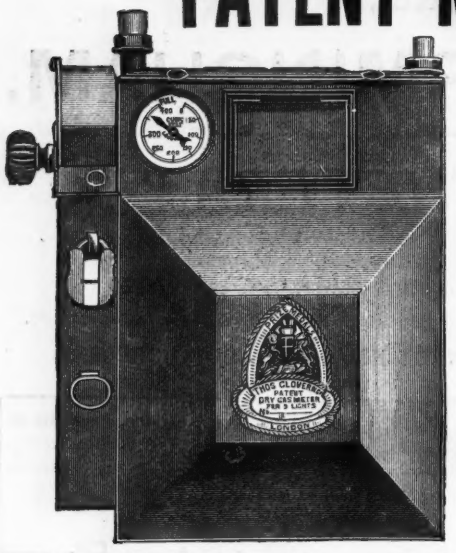

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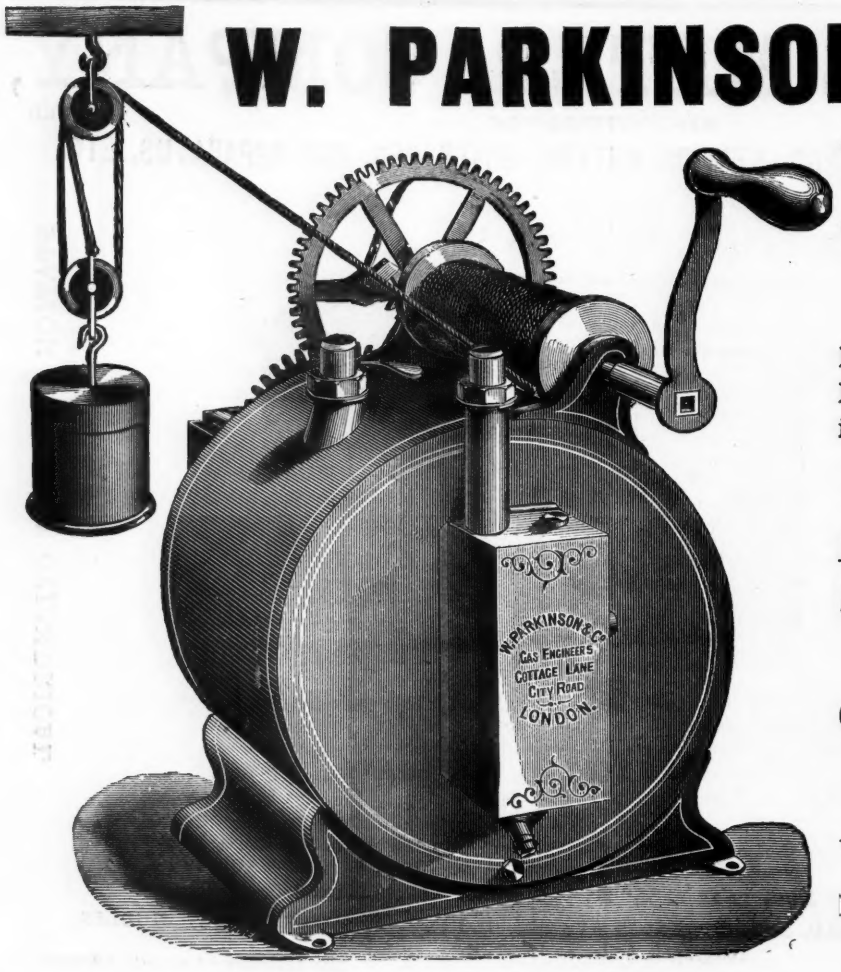

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EDITORIAL NOTES.

The Law and the Lawyers.

THERE has lately been a meeting of the Incorporated Law Society, in Birmingham, when an address was delivered by the President, Mr. Joseph Addison, which was made the subject of a "Times" article devoted to such a trenchant criticism of law and lawyers as must have made many members of the profession wonder why the sky did not forthwith fall, and obliterate Printing House Square. Not for the first time were the well-to-do gentlemen who constituted Mr. Addison's audience reminded that, in the estimation of the public, both the law of England and those who live by it need a good deal of improvement; but this particular article was distressingly candid on the subject. The fact of the matter is that the making and administration of our laws are alike unsatisfactory; and what merit Acts of Parliament and judicial decisions possess, is heavily depreciated, in the judgment of those who are not lawyers, by the great expense, delay, and uncertainty that attend all attempts to obtain the benefit of them. Mr. Addison indignantly repels the suggestion, imputed to a prominent parliamentarian, that lawyers like to pile up costs and delay the decision of lawsuits. But it must be admitted that, if a layman talks to a lawyer on the subject of procedure, the professional gentleman can seldom be brought to see that there is anything to complain of in the system to which he has grown accustomed. It is difficult to say which is in the worse condition—a client who has contentious, or non-contentious law business. He is pretty certain to be sorry before he has done that his business did not belong to a different category.

It is, however, possible for laymen and lawyers alike to agree with regard to some questions of common interest; and when they do, their unanimity is all the more remarkable for being without hope of very much practical fruit. There is a question of legislation, for instance, which has often to be discussed in these columns. Mr. Addison holds that over-legislation is a great evil, and that Acts of Parliament intended to cure some of the specific evils of modern business methods are likely to do more harm than good. "Legislative directions of what shall or "shall not be done in matters of business should be "sparingly applied; it does not seem to me that the "growth of our world-wide trade and enterprise is in any "degree owing to legislative leading-strings." Yet so long as Parliament is constituted as it is, there will always be a tendency to devise special legislation to deal with matters that had better be left alone. Another lawyer, Mr. E. K. Blyth, contributed to the Birmingham meeting a forcible paper dealing with the shortcomings of Parliament as a legislative machine. He pointed out the enormous waste of time and power caused by the rule that forbids the stages of Bills being extended beyond one session. Nearly every foreign Legislature carries over unfinished measures from one session to another; but though a reform in the same sense has commended itself to our foremost parliamentarians, it has never been allowed to take effect. Many consequences follow from this rule. Public Bills of a non-political cast take years to pass, if they pass at all; and there is a strong temptation to try to get things done by Private Bills which ought to be dealt with by means of a public measure. Another evil pointed out by Mr. Blyth is the custom of legislating by inclusion—that is, adopting by a single section a number of clauses from other Acts. Similar to this is the practice of repealing certain parts of an enactment, or certain words of a clause, instead of repealing the whole enactment or clause and re-enacting a complete and comprehensible clause in its place. The Public Health Act, 1875, is an example of an Act of 343 sections, which has been amended by some thirty-four separate subsequent Acts which touch upwards of 100 sections. These have been so amended, explained, extended, repealed, or partially repealed, that the law on the one subject has to be found in fragments from thirty-five different Acts. "There are none of us," said Mr. Blyth, "who have not felt the difficulty of advising on a "legal question which has to be ascertained by piecing "together a large number of different sections. The "chance of overlooking a small modification is so great "that it is a sort of pitfall for lawyers." It is, of course, the same with Private Acts, "only more so." One can

scarcely take up a Private Gas Act without discovering something in it that refers to some other Act or Acts which are sure not to be available for instant reference, and may be entirely out of reach. It is a farce to require Private Acts to be on sale at a price which is supposed to render them generally available for the instruction of the public, while upon the very points on which information is needed the reader may be sent to statutes not kept at the same place, or saleable on the same terms.

When complaint is made with respect to such matters as those mentioned above, the familiar difficulty of whom to appeal to for putting things to rights never fails to present itself. One must not blame lawyers overmuch for imperfect legislative methods; because, though there are more of them than of men of any other profession in the House of Commons, they are still a minority of the House, and cannot have their own way in it—either for good or for evil. Procedure is another tangle for which the profession must not be held to be wholly responsible. Perhaps the clearest grievance that the public has against lawyers, apart from the delicate question of fees and expenses, is the indifference of the profession as a whole, and as a rule, to that natural longing for improvement of methods—the wish to experience the sense of progression—to which nearly every other profession willingly submits. One cannot help feeling that Dickens's Mr. Spenlow, with his dislike to all suggestions of even the most obvious reforms, is still the type of the respectable practitioners of the "lower branch" of the profession. There is something peculiarly irritating to the lay mind in this incompatibility of the law and lawyers with the constant striving after a higher rate of efficiency which is the rule of existence in other departments of human activity; and it only needs the added suspicion that this archaism is profitable to those who cultivate it, to explain why even "The Times" should appear disposed to echo Mr. Bumble's opinion of the law.

Gas Profits at Widnes.

The perennial question of the right way to dispose of the profits of a municipal gas undertaking has become acute at Widnes, as will be seen from the rather lengthy, yet condensed, report of the last monthly meeting of the Town Council in another column. It may be remembered that on the occasion of the annual meeting of the Manchester District Institution of Gas Engineers last February, Mr. Isaac Carr, of Widnes, delivered as President an Inaugural Address in which the policy of appropriating gas profits to subsidize the rates of a town was stigmatized in somewhat stronger terms than municipal officials usually feel free to employ in dealing with questions of this nature. It is unnecessary for us to state again the "Journal" position in this regard, seeing that we have always championed the cause of cheap gas and justice to the gas consumer, both in season and out of season, at the risk of wearying the bulk of our readers, and certainly to the annoyance of those who take exactly the opposite view. The explanation of Mr. Carr's boldness in this cause is now made apparent; for the Chairman of the Widnes Gas Committee, and his supporters in the Council, have just been compelled to fight—and vainly, for the moment—against a proposal which has no other meaning than the determination of the era of cheap gas in Widnes. The Finance Committee of the Town Council have recommended that the Local Government Board be asked to alter, by a Provisional Order, the Widnes Improvement Act, 1867, so far as it provides for the application of the gas and water profits, so as to give the Council power to deal with these profits in their own way. There can be no mistaking the meaning of this. At present there is no power to subsidize the rates out of these profits; and the price of gas is consequently cut as fine as possible—any surplus revenue being applied for the good of the works. Of course, the Finance Committee protest as loudly as they can that they have no desire whatever to raise the price of gas. But it is an insult to the intelligence of the very stupidest gas consumer in Widnes to suppose that he could fail to perceive the motive of the move. There is hardly another municipal gas undertaking in Lancashire (where so many gas-works have been municipalized) that is not made to pay, and pretty smartly too, in aid of the rates. Not that the ratepayers benefit thereby to the extent that the appropriators of the money would like them to believe; because it is generally found that money that does not come directly out of the rates is used to cloak corporation extravagance. The Board of Trade returns are eloquent on the comparative circumstances of the consumers of gas supplied by Lancashire municipalities. At Widnes, the price of 18-candle gas, according to the latest return, is only 1s. 10d. and 2s. per 1000 cubic feet, less 2d. discount. There is nothing like this in all Lancashire; and it will not last much longer at Widnes if the Finance Committee get their hand into the till of the Gas Department, by the complaisance of the Local Government Board. Even the local newspaper confesses inability to understand why the Finance Committee wish to alter the law, if they do not desire the profits. This is the view that most sensible people made acquainted with the circumstances must take.

The Question of Fixed Corporation Loans.

At the autumn meeting of the Institute of Chartered Accountants, held in Sheffield, Mr. Alderman Franklin, F.C.A., the Chairman of the Finance Committee of the Sheffield Corporation, read a paper on "Corporation "Finance," in which most of the questions raised of late years in regard to this important subject were fairly considered. The outstanding loans of local authorities in England and Wales amounted in 1893 to £215,343,545, more than half of which was put on the rates during the preceding eighteen years. This period, therefore, was one of marked municipal expansion and development, when large sums of money were spent on gas and water works, markets, tramways, and for other directly remunerative purposes. A vast amount must also have gone into sewers and pavements, which, if not actually remunerative, has at least a positive economical value. Alderman Franklin discussed the modes of repaying municipal loans; and he referred to the controversy which took place on the subject in 1892. It is argued against the annuity principle that it is unfair to place on posterity a charge equal to that borne by the present generation, for debts which posterity had no voice in creating, and in respect of works, the cost of the repair of which would hardly ever fall on those who embarked upon such enterprises. On the other hand, the advocates of the annuity principle maintain that, as the undertakings were created for the purpose of benefiting posterity in as full a measure as the present generation, and as posterity will inherit undertakings and properties free from the indebtedness paid off by their predecessors, the annuity principle is the just and equitable one. This is the view taken by the Sheffield Corporation. The subject of the rapid and serious decline of the interest-bearing power of money seriously exercises municipal financiers just now, as it is very difficult for them to properly invest the accumulations of their sinking funds. This difficulty has suggested the idea of a central bureau for municipal financing, by means of which a greater uniformity of terms of issue and returns might possibly be assured, and Corporations could be assisted in borrowing from and lending to one another. The idea has not been taken up—mainly, as Alderman Franklin hints, because the large army of financial intermediaries does not greatly care for it. In the discussion which followed the paper, Mr. Edwin Guthrie, of Manchester, took the point we have made on previous occasions, as to the shortcoming of the Legislature in failing to distinguish between Corporation loans obtained on wasting properties, and for tangible assets which have a realizable value. He held that, subject to very moderate powers for creating reserve funds, it would be reasonable and proper to have a permanent stock, non-redeemable, representing trading assets and properties, such as gas undertakings, tramways, and water-works, which remain for the permanent benefit of future generations. Mr. Thomas Bowden, of Newcastle, also observed that he could not see why a Corporation should not have a floating non-redeemable debt; and Mr. C. Fitch-Kemp, of London, spoke in favour of the same arrangement as being for the benefit of the investing public. This is a matter that should not be allowed to drop.

A View of British Industry and Finance.

Mr. W. Woodall, who was a member of the Royal Commission on Technical Education, last Thursday addressed the annual meeting of the Technical Schools of Leicester; and, as was to have been expected, his observations were characterized by much acumen. Technical education is a subject upon which a vast amount of nonsense has been

talked of late by many people who should have known better; but Mr. Woodall is a man who can be trusted not to talk "in the air" upon anything—no mean repute for a modern statesman. Speaking of foreign competition with British trade and manufactures, he impressed his hearers with the fact of the seriousness of this rivalry, and warned them against allowing themselves to remain possessed of the illusory sense of British superiority to the strenuous foreigner which has by no means vanished from among us. If the employer is struggling out of this "Fool's Paradise," the British workman is unhappily content to go on living in it; trusting to his Trade Union to keep him in work and wages whatever may befall. If the technical schools of Leicester or any other manufacturing town can only teach the British workman that h does not know everything that is worth knowing in his own particular line, and that there is plenty of room for improvement in all trades, they will accomplish a great work. Mr. Woodall uttered an unquestionable truth when he told his Leicester audience that "a close "examination of the conditions of competing trade would "show that, whatever might have been the case at one time, "we had not so much now to fear from cheap imitations "of our productions as from the rival excellence of "design and manufacture worthily competing in attrac- "tiveness and quality." Another memorable caution referred to the threatened British pre-eminence as the promoters, constructors, and financiers of great enterprises for all the world. "There was a time when the "foreigner looked to England to take up his concessions, "to provide his towns with gas and water works, to lay "down railways and tram lines, and to undertake to "furnish him with all the larger projects demanding "resources of production and the capital necessitated." While admitting the difficulty of forming a reliable judgment respecting such a matter as this, Mr. Woodall was of opinion that greater effort will be required to maintain this British position in the future. It may be doubted whether any effort will enable British enterprise to do more than hold its own in these respects; for the conditions have altered since the era spoken of by Mr. Woodall, when most of the disposable capital of the world, and much of the industrial ingenuity at the command of civilized mankind, were alike of British origin. We cannot prevent other nations from educating and training themselves to do their own work, and as much of the general work of the world as they can get. Moreover, growth of international capital must necessarily alter from time to time the position of the centre of financial gravity. It is probably still to be found within hail of Threadneedle Street; but it may not always remain there. For the present, it seems as though the tendency of capital to domicile itself, so to speak, in England were stronger than ever, judging from the liveliness of the British joint-stock company system.

An Acetylene Explosion.

On the eve of going to press, news reaches us of an explosion of acetylene at the Paris factory of M. Pictet, by which two workmen lost their lives, and the neighbourhood of the workshop was thrown into a state of panic. According to the newspaper reports, the whole frontage of the factory was blown out, and the victims were horribly mutilated. It is further stated that one of the men was engaged in the manipulation of a "*bonbonne*" (French shop slang for a storage cylinder for the liquefied gas), when it burst—one account says "through contact with the flame "of a lamp;" and the firm regard it as very fortunate that the explosion was limited to the one cylinder, and did not touch two large gasholders full of acetylene which were on the premises. It can be readily understood that the explosion might have been even more disastrous if, as is reported, the Pictet establishments keep supplies of acetylene in store, and sell it in large quantities to shopkeepers and others. As it is, however, the incident is sufficiently grave to merit particular attention on the part of those who are interested in the gas industry at large, who will await with curiosity the result of the inquiry into the circumstances which the French Government will institute in due course. It is not for us to offer any comments upon an occurrence which must be considered as *sub judice*, or at any rate cannot be regarded as fully explained by the first reports that have come to hand concerning it. The facts are sufficient, however, to serve as a warning to all and sundry of those sanguine inventors of acetylene apparatus who, as our "Register of Patents" shows week by week, are piling up patents upon patents in the hope of making profit out of the new illuminant. It cannot be too widely known that acetylene is not a thing to be played with; and while it may be as harmless as it will certainly prove illusory for people to scheme on paper all sorts of apparatus for generating or using this gas for lighting purposes, any attempts at trying such appliances by actual use can only be made at a risk that should deter most men from incurring it. How the paternal French authorities came to permit the preparation and storage of acetylene in such a locality as Montmartre, where the Pictet factory is situated, and how the flame of a lamp came to be available for provoking the catastrophe that has occurred, are among the first questions that should be answered in this connection.

WATER AND SANITARY AFFAIRS.

The letter in "The Times" on "The London Water "Question," by Mr. Henry Clarke, to which we referred last week, has since been met by a reply from Sir John Lubbock, who adheres to his view that the exercise of public control over the London Water Supply is preferable to the expense and risk consequent on the purchase of the Companies' undertakings. Another correspondent, writing with the signature of "R.," points out that if the water supply became the property of a public body, uniformity of charge throughout the Metropolis would be demanded. In order to meet this requirement, a process of "levelling up" would never be submitted to; and the lowest rate of charge at present existing among the eight Companies would become the rule for the entire supply. In that case, says "R.," "away goes the estimated profit, "and a deficit takes its place." This deficit, it is observed, "would have to be met out of an increase of the county "rate." Such is one of the arguments which show that, in the interest of the public, the water supply had better remain where it is. Not even the County Council need desire to take possession. The water supply, when entirely in their hands, is more likely to burden the rates than to aid their revenue, and would prove little better than a white elephant. There is a profit now; but how is it to be perpetuated? The Council know full well that if they pay a fair price for the water undertakings there will be but little margin left for them to play upon. "No doubt," says Sir John Lubbock, "there is always a large majority in the Council for pur- "chase on their own terms and under their own conditions; "but purchase by open arbitration has been emphatically "condemned both by the Water Committee and the Parlia- "mentary Committee." The intervention of the Council means one of two things—the spoliation of the Companies or the burdening of the ratepayers. To avoid the latter alternative, which would make them unpopular, the Council prefer the former, though they are likely enough to hit both parties. Mr. Clarke's attempt to show that anything like his scheme of purchase would yield a profit, is defective on several points. One is well put by Sir John Lubbock when he says: "Of course, if those who are now "receiving $2\frac{3}{4}$ per cent. would be satisfied with $2\frac{1}{2}$, and if "the management under a public Trust was as economical "as the present, there would for the moment be some "balance to the good." The phrase "for the moment" is significant; and it is followed by the remark: "But we "must look to the future." That future is held by Sir John as involving the introduction of a new or supplemental supply, the outlay for which must be estimated by millions. Having this contingency in view, Sir John considers that the ratepayers, if they purchase the present undertakings, will be "incurring a tremendous risk;" whereas if they adopt the policy of control, "they may gain and cannot "lose." This argument is practically the same as that which we employed last week, when remarking that if a public authority were put in place of the Companies, "the "cost of some gigantic scheme for a new supply will in all "probability entail a burden on the ratepayers; whereas, "if the Companies are left in possession, they will have to "provide the supply at their own cost."

In dealing with Mr. Clarke's proposals a week ago, we commented on the absence from his estimate of any charge for the redemption of capital, and any allowance

for compulsory purchase. Sir John Lubbock refers to these omissions, and shows, according to Mr. Clarke's own statement, that the redemption of capital "would "involve a heavy addition to the rates." Mr. Clarke indulges in the expectation that Parliament would not insist on this redemption. But Sir John sees no reason to suppose that the Legislature would make London an exception to the general rule which it has hitherto observed. This particular consideration, apart from any other, ought to be sufficient to disabuse the public mind of the notion that to get rid of the Companies is a "royal "road" to a cheap water supply. Sir John Lubbock also gives a tolerably clear hint that something would have to be allowed in the shape of compensation for compulsory sale. Why, then, should London be put to all this expense? Where is the *quid pro quo?* Sir John asks whether there is reason to suppose the water "would be purer or better "if supplied by a Trust." As for handing the business over to the County Council, Mr. Clarke himself deprecates the idea; while Sir John Lubbock is opposed to any transfer whatever, as calculated to cast a heavy burden on the rates, without any corresponding advantage to the consumer. It may be said that the Companies have no reason to concern themselves about any loss which may befall the public by the purchase of their undertakings. This is only partially true. Financial considerations govern the entire question; and the virulent attacks made on the Companies are part of a policy which seeks to drive them from their position in order to appropriate their revenue. It is well for the people of London to understand that they will not be benefited by any such change, however severe may be the damage inflicted on the Companies. The conditions of service are materially altered directly the supply passes into the hands of a public authority; and the alteration is not favourable to economy, especially in the case of the Metropolis, where the supply of water must of necessity be continually and largely increased.

Our contemporary "London" finds ground for exulting in the idea that Mr. Clarke, a Moderate member of the County Council, is a strong advocate of purchase. But Mr. Clarke does not propose that the purchase should be effected by the County Council. Replying to Sir John Lubbock when the latter quotes Mr. Burdett's statement that the opinion of financial experts is in favour of leaving the Water Companies under private management, "London" says the people to be consulted in this matter are not the financial experts, or the Stock Exchange authorities, but "the ratepayers of London." When once the ratepayers of the Metropolis rightly understand this question, we believe their opinion will be that the Council had better leave it alone. How wise are some of the advisers of the public on this question may be judged from a leaderette in the "Daily Chronicle" of Wednesday last, where it is "assumed" that the Water Companies "cajoled Parliament" into the acceptance of a certain clause in the Water Companies (Regulation of Powers) Act of 1887, whereby a "monstrous privilege" was conferred upon the Companies, exceeding anything claimed by the Chancellor of the Exchequer. Our contemporary says: "We have not looked up the Act." It would be well if the "Chronicle" could "look up" the facts concerning the origin of the measure, when it would be found that the cajoling party was the present Sir Forrest Fulton, who introduced the Bill with the clause in it conferring the "monstrous privilege" alluded to.

The Gas-Works Transfer Question at Driffield.—At their meeting yesterday week, the Driffield District Council had before them a communication announcing the price fixed by the valuers (Mr. T. Newbigging for the Driffield Gas Company and Mr. C. Sellers for the Council) to be paid to the Company for their property. The figure, as mentioned in the "JOURNAL" a fortnight since, was £22,500. The Council appointed a Committee of five members to complete the purchase.

A Large Sulphate of Ammonia Saturator.—One of the largest sulphate of ammonia saturators ever made has just been put up at the Bolton Gas-Works. It is 6 feet in length, 5 ft. 6 in. in width (back to front), and is made out of four solid lead plates 1½ inches thick, with a bottom plate 2½ inches thick. The top is supported by a central column; but additional strength is given by making it dome-shaped. The use of sand has been entirely avoided in forming the joints. The weight of the saturator, without accessory pipes, is 7 tons 11 cwt. The makers were Messrs. Joseph Taylor and Co., of Bolton.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 760.)

LAST week opened in a very depressed mood on the Stock Exchange. Much apprehension was felt with regard to the settlement; it being pretty well known that in some quarters there would be a difficulty in meeting engagements. There was some relief later, when it was found that assistance was forthcoming, and the hammer would not be called into requisition; but things fell very flat again afterwards. A faint rally was perceptible on Thursday, when it transpired that, in the opinion of the Bank of England Directors, there was no such stringency in the Money Market as would imperatively demand a rise in the rate; but again there was a relapse when gold movements seemed to indicate that a rise could not much longer be postponed. The persistent bad weather, too, had its full evil effect. Consequently prices have fallen freely; and the gilt-edged division, with Consols at the head of them, led the downward movement. The only exception in the chief departments is the American, where the political outlook is regarded with more equanimity. In the Gas Market, there has been good active business, nearly as brisk as it was in the preceeding week. Prices have varied but very little; and the general position may be pronounced steady. The few changes in quotation are slight in degree; but, with only one exception, they are all for the better. In Gaslights, there was a fair amount of business every day at very steady figures; the price never ranging much above or below 310, which was the closing mark, and at which stock changed hands almost daily. There was much more activity in the secured issues than has been seen for some weeks past; and they kept their prices up very well. There was considerable dealing in South Metropolitan at about level figures; but there was no sign of any disposition to advance. Commercials had a slight further advance on being quoted *ex div.;* and two or three transactions were marked in them at improving prices. Suburban and Provincial undertakings were quite unchanged; but several of them readily commanded top prices. Among the Continental Companies, Imperial showed further weakness, and relapsed another point. But Union and European were in good demand; and the latter advanced its price. There was nothing remarkable about the rest, beyond an upward movement by San Paulo. There was not much actually done in Water; but the prices were persistently put down again, and some quotations had a considerable fall.

The daily operations were: Business was fairly active in Gas on the opening day; and prices in general were good—the only exception being Imperial Continental, which fell 1. In Water, New River receded 1; and Chelsea, 2. Tuesday was a somewhat quieter day, and quotations in Gas did not move; but Southwark Water debenture fell 3½. Transactions in Gas on Wednesday continued to be rather limited. But there was no sign of weakness anywhere; and European and San Paulo gained ½ each. In Water, Lambeth dropped 5½. Thursday brought more activity into the Gas Market. Commercials were better *ex div.;* but other Gas quotations remained unchanged. West Middlesex Water fell 3. Friday's business was almost exclusively in Gaslight "A" and South Metropolitan, without alteration. Saturday was fairly active at steady figures. East London Water relapsed 3.

ELECTRIC LIGHTING MEMORANDA.

The Summer Expenses of the St. Pancras Electric Lighting Stations—A Source of Municipal Electric Lighting Profits—Mr. W. H. Preece Admits that Gas is Cheaper than Electric Light.

IT will be seen from a paragraph in our "Electric Lighting Notes," in another column, that the progress of disillusionment in regard to the commercial aspect of the St. Pancras electric lighting enterprise is proceeding apace. The financial statement to the 10th inst., presented to the Vestry last Wednesday, contains more than one entry relating to the electric lighting department calculated to discompose the ratepayers. The provision of a refuse destructor at the King's Road station, which was to do wonders in the way of reducing working expenses, so far only appears to have run the Vestry into an outlay of £5843 without yielding any noticeable return. One scarcely knows what to make of the statement that the receipts on electricity account of the Regent's Park station since Lady-day are only £10,678, while the payments on this account for the same period amount to £34,464; thus leaving the account overdrawn by £23,786. Similarly, the electricity account of the King's Road station is stated to have been overdrawn by £13,996. If these figures represent the loss due to working the stations during the summer season, with its low load-factor, they create a bad look-out for the ratepayers. There does not seem to be much comfort for the same victims of Vestry progressiveness in the reported assertion of the Chairman of the Electricity Committee, that the introduction of electric lighting into the parish had not caused any diminution in the number of gas-lamps in use. The net result of Wednesday's Vestry meeting was that, in settling the parish budget for the current

half year, it was found necessary to put another halfpenny on the lighting rate. We do not desire to lay undue stress upon the particular figures given above as representing the recent financial history of the St. Pancras Vestry's electric lighting undertaking. They look very bad, of course; but then they refer to the worst season for the business. Electric lighting companies, and it may also be said gas companies, do not publish their summer working accounts. All the same, it is a curious speculation to try and imagine at what price St. Pancras electric shares, if there were any, would stand in the market.

The analysis of the accounts of the Leicester Corporation Electricity Department, published in the current issue of the "Electrical Review," illustrates very plainly some of the reasons why there is not more loss than there is on municipal ventures of the kind. Regarded from another point of view, the same data show why a prosperous and well-managed gas undertaking can in some circumstances "oblige the public" with a cheap and efficient electric lighting service as a minor branch of the general concern. The principal figures of these Leicester accounts appeared in the "JOURNAL" for the 6th inst., showing a loss to Midsummer of £2060, which it is confidently hoped will be wiped off in the course of the next two years—that is to say, the current year is to show a clean balance-sheet, and afterwards there is to be a profit. It is to be trusted that no untoward occurrence will happen to spoil this cheerful picture. The question arises: What is this expected "profit"—how is it to be made up? The analysis now before us supplies at least a partial answer to this inquiry. The capacity of the busy town of Leicester for absorbing electric light is measured by the prudent Corporation in the modest expenditure of £42,748 on capital account. If more is wanted, of course, it will be spent. But, to begin with, this is the extent of the ratepayers' obligation incurred in placing the luxury of electric lighting at the disposal of those townspeople who wish for it. It is unnecessary to go through all the working statistics to show how this capital is employed; but under the heading "cost of production" it can be seen that the whole cost for a year's management, administration, office work, stationery and printing, general establishment charges, law, audit, and insurance, amounted to only £346. It will be hardly any more when the volume of business done is quadrupled. This is where the municipal electric lighting branch of a gas undertaking gets the pull denied to an electric light company, and even to a local authority without a gas undertaking to fall back upon for site, fuel, skilled supervision, and multitudinous other advantages. We do not say that these advantages are anything but perfectly legitimate; but they are neither to be overlooked nor gainsaid when the origin of electric lighting "profits" is in question.

Reference was made in this column last week to Mr. Preece's British Association paper on incandescent lamps. It came out in the course of this elaborate paper that when the charge for electricity is as low as 3d. per unit, and lamps are priced at 1s. 3d. each, those lamps which have too high a rate of electric efficiency to start with compare unfavourably in total cost with steady-going articles taking their 4 watts per candle. Even under the exceptional condition of electricity at 3d. per unit, Mr. Preece's best result was far above the cost of gas. Professor Ayrton pointed this out; his remarks being reported as follows: "The least value that Mr. Preece had arrived at under the most favourable conditions was 0·015d. (per candle-hour). It ought to be borne in mind that even that most favourable result was a good deal higher, not lower, than lighting by gas with ordinary argand burners, and was far dearer than gas with the Welsbach lamp." In reply, Mr. Preece said that "gas per hour was unquestionably cheaper than electric light. The economy of electric light was not during the time it was burning, but one only used it when it was wanted. A gas-burner was used twice as long as an electrical one." In acknowledging this tardy confession by one who has vainly essayed to make people believe that the electric lamp is the poor man's light, it would be ungracious to cavil at the saving clause with which Mr. Preece covered his retreat from a position he can never again attempt to occupy with this record against him. We are quite willing to admit that an electric lamp is the most economical means of lighting known to science—when it is not in use; and this is all that Mr. Preece's last contention amounts to. The idea of the superior economy of electric lamps due to the facility with which they can be turned off and on, is always a precious one to electricians; and we have no desire to deprive them of whatever solace they can derive from this reflection. Rather would we go a long way with them, and confess with regret that careless people, including the great army of domestic servants, are not half sharp enough in saving all the expense they might by simply turning off gas-burners when their light or heat is not wanted. If we are asked to believe that this failing vanishes from the household into which electric lighting is introduced, we will try to stretch our complaisance to the verge of credulity. But, after all, this is making a strong demand on a power of faith which life in a sceptical world, ameliorated by the reading of many electricians' prophecies, has not left very robust. It is enough for the time being that Mr. Preece has confessed that gas is capable of doing the work of lighting very much more cheaply than electricity, even at the visionary price of 3d. per unit, and that not an electrician attending the British Association meeting ventured to say otherwise.

JOHN M'CRAE.

It is with much regret, in which, we are sure, many of our readers, more especially those residing over the Border, will participate, that we record the death of Mr. John M'Crae, the Engineer and Manager of the Dundee Corporation Gas-Works. Mr. M'Crae, accompanied by his wife and several members of his family, left Dundee on the 9th inst. to spend the week-end at Crail, on the Fifeshire coast, where he had a house; his intention being to return to Dundee on the following Monday. Shortly after seven o'clock on the evening of that day, he started for the railway station in the company of two friends; but on the way he was suddenly taken ill, and had to be conveyed back to his house. Medical assistance was immediately summoned; but it had scarcely arrived when Mr. M'Crae expired—the cause of death being heart disease.

It may almost be said of Mr. M'Crae that he took in gas with his first breath; for he was the son of the late Mr. Boyd M'Crae, who held the position of Manager of the Dundee Gas-Works from 1866 to 1880. He was born in Airdrie in 1852, and began his education at the Dundee High School, where he distinguished himself in mechanical subjects. He subsequently studied chemistry and natural philosophy at St. Andrew's University. He had evinced a desire to follow his father's profession; and when the Dundee works were taken over by the Gas Commissioners in 1868, he was appointed Assistant-Manager. In 1875, he left Dundee to take the position of Manager of the Bury St. Edmunds Gas-Works. This he held till the death of his father in 1880, when he was selected, out of a long list of candidates, to succeed him. It is pleasant to record that the appointment gave general satisfaction. Once installed in office, Mr. M'Crae set about carrying out several improvements which were necessary to keep pace with the rapid extension of the city. He gradually replaced all the old plant by modern appliances, and finished by bringing the works up to such a condition of excellence that they could rank with the best in Scotland. When he took charge of them, their producing capacity was about 350 million cubic feet per annum; now it is something like 500 millions. In the supervision of the works, he had the assistance of his brother, Mr. W. M'Crae.

As our readers are aware, the late Mr. M'Crae was a prominent member of the North British Association of Gas Managers; and he occupied the presidential chair when the Association met in Dundee in 1885. His contribution to the Transactions embraced a variety of subjects of great interest to the gas engineering profession. In 1883, he read a paper on "The Desirability of Gas Companies and Corporations Letting Gas-Stoves on Hire;" in 1887, he described an improved adaptation of the Siemens furnace; in the following year, he discoursed on "Coal Tar as Fuel for Steam-Boilers;" in 1889, he read a paper on "Main Laying;" and in 1892, one on "Coal Analysis"—a subject which was reported upon in the following year by the Research Committee. He was one of the first to take steps to perpetuate the memory of Murdoch; and when this subject came before the members at their meeting in 1884, he stated that, though the Committee were quite unanimous respecting the expediency of having a memorial, he almost stood alone in thinking that it should not be of granite or stone, but should take "some practical and useful shape" in the form of a bursary or money prize to encourage students in the profession to which Murdoch belonged to improve themselves. Mr. M'Crae, Mr. M'Gilchrist, and Mr. MacPherson, it will be remembered, were the Committee to whom was confided the disposal of the funds raised; and the last public utterances of Mr. M'Crae on the subject were heard at the meeting of the Association in July, when he submitted the proposition to put up in the Glasgow University a gas-engine, to be called the "Murdoch Memorial Gas-Engine." Mr. M'Crae by no means restricted his usefulness to the North British Association. He presided at the Informal Meeting of Scottish gas managers held in Glasgow in 1888, and delivered an interesting and useful address; and when, in the following year, Mr. W. Mackenzie was unable, through illness, to take the chair, Mr. M'Crae came forward, and proved a very efficient substitute. In 1876, while at Bury St. Edmunds, he joined the British Association of Gas Managers, and remained with that body, under its altered title of The Incorporated Gas Institute, till his death. He was elected a member of the Council in 1889. His paper at the meeting in Edinburgh last year, on "The Management and Remuneration of Gas Workers," and the discussion to which it gave rise—which the author thought was more valuable than the paper itself—will be fresh in the recollection of our readers. Mr. M'Crae took a broad view of things; and therefore he found ample scope, outside the sphere in which his life-work was carried on, for the exercise of his many excellent qualities.

In private life, Mr. M'Crae's genial disposition attracted to him a large number of friends, by whom, not less than his professional brethren, his loss will be keenly felt. He leaves a widow and six children.

The interment took place in the Eastern Necropolis, Dundee, on Thursday. The Lord Provost (Sir James Low) was present; and so numerous were the private and professional friends who

desired to follow the body of the deceased to its final resting-place, that twenty coaches were required to accommodate them. On arrival at the Necropolis, the *cortége* was met by about 200 employees at the gas-works, who had requested that they should be allowed to pay this tribute of respect to the memory of the late esteemed head of the department. The pall-bearers were: Mr. Boyd M'Crae and Mr. John M'Crae (sons); Mr. Andrew M'Crae and Mr. William M'Crae (brothers); Mr. Robert M'Kay, Glasgow (brother-in-law); Mr. J. C. MacLintock, Stirling (father-in-law); Mr. Thomas Wilson, Coatbridge (cousin); Mr. Boyd M'Crae and Mr. Andrew M'Crae, Monifieth (nephews); and Mr. W. Lawson, the yard foreman at the gas-works. The coffin, which was of polished oak, bore the following inscription: "John M'Crae, Gas Engineer, Dundee. Died 12th October, 1896, aged 44 years." It was covered with wreaths, of which a large number were sent by friends and by the workmen and officials at the electric-lighting station and the clerks in the Treasurer's office; and a magnificent china wreath on a massive marble stand was forwarded by the employees at the gas-works.

PERSONAL.

Mr. E. BENNETT has been appointed to succeed the late Mr. Gideon Pittman as Manager of the Saltash Gas-Works.

Mr. F. W. CHURCH has been appointed Secretary of the Gas-Meter Company, Limited, in succession to the late Mr. W. A. Cogar. Mr. Church has been connected with the Company for upwards of twenty years.

The inquiry into the circumstances attending the death of Mr. G. J. GRAY, the Secretary of the Colonial Gas Association, Limited, recorded in the "JOURNAL" last week, resulted in a verdict to the effect that it was caused by an accident. Deceased sustained a severe fracture of the skull, and inflammation of the brain followed. The Coroner (Mr. J. Troutbeck) remarked upon the strange nature of the case.

Mr. A. B. PILLING, the Town Clerk of Heywood, has been appointed Town Clerk of Devonport, in succession to Mr. J. J. Venning, resigned. There were 31 applicants for the post. A point in Mr. Pilling's favour was his connection with the work of converting the gas and water annuities at Heywood. Formerly these amounted to £360,000; but Mr. Pilling devised and carried out a scheme by which three-fourths of the annuities were converted into 3 per cent. redeemable stock, and a further £23,000 worth were redeemed by cash raised by the same class of stock. The transaction made a large immediate profit for the Corporation, with the prospect of a still greater saving in the future.

Issue of Debenture Stock of the Lambeth Water Company.—In response to the invitation of the Directors of the Lambeth Water-Works Company for tenders for £50,000 of redeemable 3 per cent. debenture stock of the Company, applications amounting to upwards of £80,000 were sent in; the prices ranging from par to £106 per cent. The average figure at which the stock has been allotted has been £102 7s. 1d.

The Matlock Bath District Council and the Gas-Works.—The price to be paid by the Matlock Bath District Council for the undertaking of the Matlock Bath Gas Company, power to purchase which compulsorily was obtained by the Council last session, is likely to be a matter of reference. The Council have proposed Alderman Sir Bosden Leech, of Manchester; but the Company object to him, and have suggested one of the following gentlemen: Sir W. Coddington (the Chairman of the Committee of the House of Commons who had the Council's Bill before them), Mr. Corbet Woodall, M.Inst.C.E., or one of the Inspectors of the Board of Trade. The Council accepted Sir W. Coddington; and he has been communicated with on the matter.

Sand Filtration of Water in Philadelphia.—Mr. A. Hazen, of Boston, the well-known expert on the filtration of water by sand, has been turning his attention to Philadelphia, with the view of bringing this process into use for purifying the water supplied to the city, which is taken from the Delaware and Schuylkill Rivers. The existing reservoirs have a capacity of 1400 million gallons, or about enough for six or seven days, at the present rate of consumption. This large area facilitates sedimentation, which removes mud and destroys many pathogenic bacteria. If filtration were introduced, there would be no bacteria to be killed; and consequently the capacity of the reservoirs might possibly be reduced. The present consumption of water is about 180 gallons per head per day; and to bring this down to a reasonable rate, it is recommended that water-meters should be used. Estimating that the population will be 1,300,000 in 1900, and that the average consumption will then be reduced to 100 gallons, but that 150 gallons will be needed at times of maximum consumption, Mr. Hazen has prepared estimates for filtering 195 million gallons of water daily at an average rate of 2 million, and a maximum rate of 3 million gallons daily per acre. The cost of the operation is given at $3·50 per million gallons filtered. Mr. Hazen says that it is possible to construct sand filters and get a sufficient supply of water from the Delaware River; and a filtering capacity of 195 million gallons per day can be obtained for $3,400.000, or about £680,000.

WATER ACTS FOR 1896.

(*Continued from p.* 689.)

THE Barnsley Corporation (Water) Act empowers the Corporation of Barnsley to obtain a supply of water from Hagg Brook and other tributaries of the River Porter or Little Don, in the township of Bradfield. For this purpose the Corporation are authorized to construct an impounding reservoir across the valley of Hagg Brook, with the necessary subsidiary works and pipe connections. In addition to the lands required for these works, which are to be compulsorily acquired within three years, the Corporation are empowered to purchase by agreement 150 acres for the purposes of their water undertaking. Clauses are inserted for the protection of the Earl of Wharncliffe, as landowner. The Corporation may discharge water from their authorized works into any available streams or watercourses. Subject to the provisions of the Act, the Corporation can take all the waters of Hagg Brook, Edge Cliff Brook, and Shaw Brook at and above the point at which the embankment of the authorized Midhope reservoir crosses the Hagg Brook, and of Thickwoods Brook at and above the catchwater drain to be made for the purpose. The quantity of compensation water to be discharged down the impounded stream is set out in detail, and is to be in a regular and uniform flow. Agreements with the Sheffield Corporation and Messrs. Samuel Fox and Co., Limited, are scheduled and confirmed. [This part of the Act requires to be taken in conjunction with the Sheffield Corporation Act to be mentioned later.] Persons who may be injured in any way by the failure of the Midhope reservoir are to be fully compensated. The water limits of the Corporation are extended. The supply need not be constant. Rates for domestic supplies within the limits of the Act are not to exceed by more than one-third those leviable within the borough under the Act of 1862. Sanitary authorities within the limits are empowered to demand a supply of water in bulk after the completion of the Midhope reservoir, at the price of 10d. per 1000 gallons exclusive of meter rent, subject to certain provisions. As an alternative system of payment, such local authorities may elect to pay a stated return on the cost of their share of the supply. No meter, whether the property of the Corporation or otherwise, is to be altered or repaired except under their direction or with their consent. All water supplied by the Corporation under this Act is to be properly and efficiently filtered, or otherwise treated, so as to prevent it from acting on lead in such a manner as to endanger the health of the consumer, under penalty of £10 per day for default. For preventing fouling of the sources of supply, the Corporation are empowered to take action anywhere beyond the borough as if they were the local sanitary authority. The sum of £170,000 is to be raised for the purposes of the Act, which amount is to include the cost of opposing the Sheffield Corporation Bill.

The Barry Urban District Council Act enlarges the water limits to include so much of the parish of St. Andrew's Major as lies on the western side of Dinas Powis Brook. An agreement between the Barry Council and the Llandaff and Dinas Powis Rural District Council is scheduled and confirmed. A prior agreement, under which the Cardiff Corporation supplied this district with water in bulk, is annulled; and the supply is transferred to the Barry Council, upon terms set out in detail. Additional water-works are to be constructed by the Council, including a well on Dinas Powis Moor. Lands are to be acquired for water-works purposes; and the new works are to be completed within seven years. The sum of £6280 is to be expended for the purposes here specified; and it is to be repayable in thirty years.

The Bilston Improvement Act contains a part relating to water. It enacts that the Bilston Urban District Council may supply water within their district. An agreement entered into between the Corporation of Wolverhampton and the Council for the transfer to the latter of the right to supply the Coseley district, together with the necessary mains and other property, is scheduled and confirmed. Power is reserved to the Coseley District Council to acquire their portion of the undertaking at any time. A clause is inserted for the protection of the Seisdon Rural District Council. The Bilston Council are not to be compelled to supply water to certain parts of the Seisdon district unless paid interest at the rate of 5 per cent. upon their outlay on the mains. The rate for domestic supplies is not to exceed 7 per cent. in any part of the district, including Coseley. The rate for lock-up shops and houses only occupied by caretakers is subject to agreement. The reserve fund is increased from £2000 to £5000. If the Birmingham Canal Navigations require to alter the position of any water-pipes, the Council are to pay the expenses of such alteration, and are not authorized to take any canal water or interfere with the navigations. The sum of £7750 is to be appropriated to these purposes, repayable in fifty years.

The Birmingham Corporation Water Act authorizes the deviation of the aqueduct (work 27) sanctioned by the Act of 1892, in two places, and also the construction of an additional railway, seven furlongs in length, in the parish of Frankley to be completed within five years. Additional facilities are granted to the Corporation for obtaining access to lands upon which they are authorized to deposit spoil when such lands are

separated from their water-works by intervening land, subject to provisions for the protection of landowners.

The Dewsbury and Heckmondwike Water Act authorizes the construction by the Dewsbury and Heckmondwike Water-Works Board of an additional pipe-line between the township of Thornhill and the parish of Dewsbury, subject to certain provisions for the protection of the Thornhill District Council, the Lancashire and Yorkshire Railway, and the Calder and Hebble Navigation. The works are to be completed within ten years. A contract between the Dewsbury Corporation and the Ravensthorpe Urban District Council is transferred to the Water-Works Board. The Corporation are empowered to borrow £49,540, and the District Council £15,180, for sixty years, for the purposes of the Act.

The Drogheda Corporation Act extends the borough limits, and provides for the transfer to the Corporation of the undertaking of the Drogheda Water-Works Company, upon such terms as may be agreed upon or ascertained by arbitration under the Lands Clauses Act. A filter-bed is to be constructed adjoining the existing Rosehill reservoir of the Company, to be completed within three years. The Corporation are authorized to borrow the money required for the purchase of the undertaking, and also £10,000 for its improvement, repayable in fifty years.

The Edinburgh Extension Act contains a clause making the limits of compulsory water supply co-extensive with the enlarged city boundary as defined by the Act.

The Falkirk and District Water (Additional Supply) Act authorizes the construction by the Water Trustees of an enlargement of their Faughlin reservoir, situate partly in the parish of Kilsyth, and partly in the parish of Denny, Stirlingshire; an enlargement of their Little Denny reservoir; and sets of filter-beds. The water of the Slachristock and Faughlin Burns is to be taken for the purpose of supply, and that of the Earl's Burn for providing compensation. The provisions relating to the discharge of compensation water are set out in detail. The new works are to be completed within ten years. Power is taken to repair and cleanse the water-works, and to empty the water into any available channel. The limits of compulsory supply are extended to the borough as enlarged by the Falkirk Corporation Act, 1890. The Trustees may supply water in bulk within the parishes of Falkirk, Larbert, Bothkennar, Airth, and Polmont. The sum of £70,000 is to be raised for water-works purposes. Water supplied by meter is to be charged for at a price not exceeding 4½d. per 1000 gallons. The Act of 1888 is amended in several particulars.

The Huddersfield Water-Works Act authorizes the construction by the Corporation of a line of mains and a service-tank for the supply of the township of Shepley, to be completed within five years. The time limited by the Act of 1871 for the completion of the Blakeley reservoir is extended to July 13, 1901. Certain additional lands are to be acquired. Water may be supplied in bulk to local authorities through whose districts the authorized works may pass; and also, with the consent of the Local Authority, to any person. Clauses are inserted for the protection of the Corporation of Batley as well as the Dewsbury and Heckmondwike Water-Works Board. The costs of the Act are to be borrowed; but the expenses of carrying it out are to be defrayed out of the water revenue.

The Kirkcaldy and Dysart Water-Works Act authorizes the construction of a new reservoir, to be called the Holl reservoir, to be wholly situate in the parish of Leslie, and to be formed by an embankment across the Lothrie Burn; of another reservoir, called the Arnot reservoir, to be formed by impounding the stream called the Arnot Burn in the parish of Portmoak; and of the necessary subsidiary works. The waters of several streams named are to be taken, subject to liability to discharge compensation water continuously at the rate of 260 gallons per minute down the Lothrie Burn, and 203 gallons per minute down the Arnot Burn. All sporting rights are reserved to the owners of the land, who are empowered to see that the reservoirs and other works are constructed in a sound and workmanlike manner. The works are to be completed within ten years. Sundry provisions are inserted for the protection of the Rothes Estate; including the obligation to build a new bridge across the River Leven. The Commissioners are authorized to supply hydraulic power. The sum of £100,000 may be borrowed for the purposes of the Act.

The Lanarkshire (Middle Ward District) Water Act sanctions the abandonment of the reservoir No. 2 authorized by the 1892 Act of the District Committee, and the construction of one, to be called the Glengavel reservoir, to be situated on the streams called the Glengavel Water and the Powbrone Burn; of another reservoir on the Lintmill Burn; and a third reservoir on the Logan Water, with numerous subsidiary works. The water of twelve streams is to be taken, subject to the provision of compensation water according to the Act. The works are to be completed within seven years. Until the District Committee are supplying water for domestic purposes from the works authorized by the Act of 1892 and this Act, the County Council are to pay all interest and instalments of principal a tthe same fall due, and accumulate the payments with 3 per cen . interest thereon against the time when the water-rates become leviable. These rates are to be increased for a time in order to repay such advances.

The Leamington Corporation Act contains a part relating to water. It is enacted that the Corporation may, instead of charging a water-rate under section 56 of the Public Health Act, 1875, charge a uniform domestic rate of not exceeding 4 per cent. upon the rateable value of the premises supplied. Moneys due to the Corporation in respect of water supplies are made recoverable summarily. The Corporation are not bound to supply otherwise than by water any dwelling-house forming part of trade premises; the charge not to exceed 9d. per 1000 gallons. Free drinking fountains and cattle-troughs may be provided by the Corporation.

The Malvern Link (Extension and Water) Act enlarges the district to include part of the parish of Cradley, which is for all but exclusively ecclesiastical purposes detached from the remainder of this parish, and added to the parish of Mathon Urban, which then becomes the new parish of West Malvern. The Bromyard Rural District Council are to cease to exercise any powers or duties in the added area from March 31 next. As from the same date, the county boundary between Worcestershire and Herefordshire is to be altered to bring the added area into the former county; and a number of consequential adjustments are also made. The limits of the Act for the supply of water are the extended district, together with the parishes of Colwall and Cradley in Herefordshire and Mathon Rural, Leigh, Madresfield, and Newland in Worcestershire. Additional water-works are authorized, including an impounding reservoir at Park Wood for collecting waters which flow into the Cradley Brook and thence into the River Severn. As compensation water, there is to be discharged into the lower channels of the impounded streams not less than 30 per cent. of the average daily flow. Clauses are inserted for the protection of certain parties interested in the impounded waters, and reserving the sporting rights over the reservoir. The works are to be completed within seven years. The rate for domestic supply is not to exceed 10 per cent. The sum of £50,000 is to be borrowed for the purposes of the Act, repayable in sixty years. Contractors for water supply are not disqualified for membership of the District Council; but they are not to vote upon any motion in respect to such contract.

Imperial Continental Gas Association.—The Directors of this Association recommend a dividend of 5 per cent. for the half year ended June 30 last, together with a bonus of 1 per cent., both tax free.

The Heating of Public Buildings by Gas.—Our attention has been called by Messrs. Ritchie and Co. to what appears to be the excessively high cost of heating by gas a room of 100 cubic metres capacity, as shown by the last paragraph of the article on the above subject in the "JOURNAL" for the 6th inst.; and they asked if there was not some mistake in the figures. On referring the matter to the translator of the article, he explained that the figures were correct, but that the standard of time should be per "term" (*Heizperiod*), and not per "diem," though the duration of the "term" is not stated in the original. Messrs. Ritchie point out that, even with gas at 3s. per 1000 cubic feet, it would cost 48s. a day to heat a room of the size mentioned; whereas they have heated many public buildings in London with their "Lux-Calor" stoves, one of which will heat the space named for twelve hours with a consumption of only 100 cubic feet of gas, costing 3½d. It seems that in certain German towns gas is supplied for heating purposes at 10 pf. per cubic metre, which would make the cost of the test at Charlottenburg about 4½d. per hour. In some towns, it is as low as 8 pf., and rises in others to 12 pf., and more; so that the cost in Germany appears to come out much higher than that of the above-named stove. Messrs. Ritchie and Co. say that one of the largest buildings they have ever heated entirely by gas is St. Anne's Church, Wandsworth, which is heated with their "Lux-Calor" gas-stoves at a cost of something less than 4d. per hour.

The Comparative Cost of Gas and Electricity.—In the course of a discussion on electric lighting at the meeting of the Ipswich Town Council last Wednesday, it was asserted by Mr. John Pratt that electricity at 6d. per unit is equivalent to gas at 3s. per 1000 cubic feet. The experience of Messrs. Gardiner and Co., of Ipswich and Leicester, however, does not confirm this. They say, in a letter to a local paper, that, if Mr. Pratt will take the trouble to calculate, he will find that 6d. per unit of current is about equal to 6s. per 1000 cubic feet of gas. A unit of electricity at 6d., they find, will maintain a 16-candle power incandescent electric lamp for eighteen hours; whereas 5 cubic feet of coal gas, consumed in a properly constructed burner, will produce a light equal to from 15 to 16 candles, and will cost 3·06d. for eighteen hours. This calculation is based on gas at 2s. 10d. per 1000 cubic feet—the present price at Ipswich. At Leicester, gas costs 2s. 4d. per 1000 cubic feet; and electricity is 6d. per unit. When Messrs. Gardiner and Co. commenced business there, they fitted up their establishment with Siemens regenerative burners, which cost 7½d. per hour for gas. Last year they had the electric light laid on with "Sunbeam" lamps; but to their surprise, when the first quarter's bill came in, they found that it worked out to 3s. per hour—nearly five times as much as gas, for about the same amount of light. The firm are about to instal a gas-engine and dynamo, for they are assured they can produce the current at 3½d. per unit, and thus save 2½d. per unit.

NOTES.

The Problem of Smoke Prevention.

The consideration of the quantity of smoke issuing from chimney-shafts, and the number of articles upon "Smokeless Combustion," have inspired the "Engineer" with the idea of explaining why this is so difficult to obtain. This is a question of the composition and physical properties of coal, and the amount of air required for its combustion. Taking a sample of Lancashire coal, the proximate and ultimate analyses of which are given, it is shown that theoretically to perfectly burn 1 lb. of such coal requires 12 lbs. of air. From this calculation, it would appear that if 12 lbs. of air were admitted to a furnace for every 1 lb. of coal consumed, the combustion would be perfect. A complication is introduced, however, by the different rate at which the volatile portion of the coal is liberated, compared with the durability of the carbon. This necessitates the very free admission of air during the period of liberation of the gases in question, resulting in a large excess of the total air supply over that theoretically required to consume the fuel, which means waste of heat. Thus the question arises whether it is more economical to reduce the supply of air, to the loss of some of the useful effect of the fuel through the escape unconsumed of part of the combustible gases, or to have smokeless combustion with excess of air. It is the usual practice to allow 24 lbs. of air per pound of fuel consumed in a boiler furnace, instead of the 12 lbs. theoretically necessary. But this is not enough to ensure smokeless combustion unless the supply of fuel is put on the fire in very small portions at a time, or is fed continuously by mechanical stokers. In the case of hand firing in the usual manner, when perhaps 100 lbs. of coal are thrown upon the fire at once, it is doubtful whether it would be possible to admit the large quantity of air necessary for the volatile gases in time to consume them before they escape as smoke. The statement is therefore all in favour of mechanical stoking.

Mr. W. H. Preece's Photometry.

In describing some tests of incandescent electric lamps at the British Association meeting, Mr. W. H. Preece stated how the illuminating power was arrived at. The lamp was suspended from a clip on a carriage which could be moved over the graduated bar. The illuminating power of the lamp was balanced against that of parliamentary standard candles on Rumford's shadow principle; and to ensure every possible accuracy, the mean value of the following three observations was recorded as the result: (1) Through green glass; (2) through red glass; and (3) without any vitreous medium, while the two lights were carefully shielded from the observer's eyes. In the official testing of incandescent electric lamps for the Post Office, measurements will be made with an improved Trotter photometer, and the standard of light will be either the Vernon-Harcourt pentane or the Hefner amyl-acetate lamp; the former being taken as representing one standard candle, and the latter as 0·88 of a standard candle. Professor Fleming criticized Mr. Preece's photometry, expressing surprise at his adoption of the standard candle and the Rumford method of shadow photometry. The speaker also said he had long ago abandoned the use of candles as photometrical standards. If photometry is not a question of instrument, it is one of observer; and for this reason Professor Fleming objects to all comparisons taken through red and green glass. What is wanted to be got at is the brightness upon a white surface as compared with that produced by a standard source of light. The Hefner lamp has been used a good deal in Germany. But it is too red a light for a standard; and besides this there are ventilation difficulties attendant on its use. The Vernon-Harcourt standard, said Professor Fleming, is of very great value, and many observers give it first place.

The Behaviour of Metal Columns in Fire and Water.

A curious result is recorded of some experiments carried out at the Continental Iron-Works, Brooklyn, on the endurance of steel and cast-iron columns under load at high temperatures. The columns in question were placed upright in a furnace supplied with gas from a producer of the ordinary type, and were loaded by hydraulic pressure. A test of a built-up steel column showed that when at a red-heat it failed to carry more than a small load. It appeared that such a column was reduced in strength by nearly seven-eighths when raised to a temperature of 1200° Fahr. The next experiments were on hollow cast-iron columns, having an estimated breaking strength of 902,000 lbs. The column when at a red heat failed under a load equal to 84·8 tons. In another experiment, a cast-iron column under the same load had a jet of water thrown on it, when the pyrometer indicated a temperature of 675° without showing any signs of injury. This experiment was repeated at temperatures of 775° and 1075°, and finally when the column had reached a light red heat and was beginning to yield. In no case did the water seem to have any injurious effect upon the column, contrary to what would have been expected.

A Sounder-Pyrometer.

A curious description of pyrometer, termed the thermophone, has been devised by Professor Wiborgh, of Stockholm; and according to the account given of the appliance in "Dingler's Journal," the principle of it is as remarkable as its name. The thermophone is a small clay cylinder containing, in an inner metallic capsule, an explosive compound which fires at a definite temperature. The method of using the appliance is simplicity itself. A cylinder is thrown into the furnace the temperature of which is to be determined, and watched until explosion ensues. One thermophone is therefore sacrificed in making every test; and the small report of the explosion, which indicates the completion of the test, justifies the name of the appliance. In designing his thermophones, Professor Wiborgh proceeded by an experimental verification of Fourier's formula giving the rate of temperature propagation in bodies. Thus the inventor has arrived at a curve and a table giving the temperatures corresponding with different time intervals. It is not claimed that the thermophone can compete in point of accuracy with the best modern pyrometric apparatus; but for certain purposes it can be used when the more delicate nature of the latter prohibits their employment. Professor Wiborgh claims to have detected by this means a variation of 20° at a normal temperature of 1000° C., which is sufficiently sensitive for many industrial operations.

Determination of Oxygen by Absorption with Alkaline Pyrogallol Solution.

At the recent meeting of the British Association, Dr. Frank Clowes, of Nottingham, read a paper in the Chemistry Section on "The Accurate Determination of Oxygen by Absorption with Alkaline Pyrogallol Solution." In the author's laboratory, it was repeatedly found that, during the absorption of oxygen from the Brin gas, a considerable volume of carbon monoxide was evolved, although this did not occur in absorbing oxygen from the air. If the evolution of the gas was known to take place, and the carbon monoxide was subsequently absorbed by cuprous chloride solution before reading off the residual nitrogen, the estimation of the volume of oxygen was correct; but if this precaution was not taken, the estimation was open to serious error. Repeated trials with varying proportions of pyrogallol and potassium hydrate showed that the evolution of carbon monoxide might be entirely prevented by using a sufficiently large excess of potassium hydrate. With the following proportions, no fear of this source of error need be felt, even when pure oxygen is being absorbed: 160 grammes of potassium hydrate and 10 grammes of pyrogallol in 200 cubic centimetres of solution. The solution is prepared by dissolving 160 grammes of potassium hydrate in 130 c.c. of water, and then dissolving the 10 grammes of pyrogallol in the alkaline solution.

The Chevalet Treatment of Feed Water.

Yet another feed-water heater, this time combined with what is called a "detartarizer," is being brought under the notice of British steam users. A specimen plant of the kind is in operation at the West Brompton central electric lighting station, where it is treating and supplying nearly 3000 gallons of water per hour to the battery of Babcock and Wilcox boilers, using only the exhaust steam. The purification of the water for raising steam is brought about by boiling it with the heat of the exhaust; thereby causing the lime to be deposited as a compact sediment in the receiving chamber of the machine itself. The action of the apparatus appears to be very similar to that of a Livesey gas-washer. For dealing with the sulphate of lime, or permanent hardness of the water, a small addition of carbonate of soda is made to the water as it enters the apparatus. A very small pump is employed for this purpose, worked in connection with the boiler feed-pump, so that a predetermined amount of soda solution is taken in with the feed. The soda (by double decomposition) changes the sulphate of lime into carbonate, which is then precipitated by the boiling action, while the sulphate of soda remains in the water as a soluble salt. The result of the working of the combined apparatus is stated to be that the water retains not more than 3° of hardness.

TECHNICAL RECORD.

FIRE-CLAY V. FIRE-BRICK GAS-RETORTS.

At the Meeting of the Gas Engineering Society on the 14th inst., Mr. J. Golding, of the Old Kent Road works of the South Metropolitan Gas Company, gave some interesting figures with the object of comparing ordinary fire-clay retorts with those constructed of fire-brick. With regard to cost, the figure given for ordinary fire-clay retorts is 4s. per foot run delivered in or within 20 miles of London, or for a setting of seven 20-feet retorts (= 140 feet) at 4s., £28. Adding cost of bricks and fire-clay for the setting, estimated at £16 10s., and labour, £15, brings up the total to £59 10s. For retorts constructed of bricks the cost per foot run would be 3s. 9d., or for 140 feet, £26 5s. Adding cost of bricks and fire-clay for setting, estimated at £21 2s., labour, £18 5s., and 14 special socket castings to carry the mouthpieces, at 12s. each, £8 8s., makes a total of £74. Thus the first cost is much in favour of the ordinary fire-clay retorts. But it was pointed out that the average life of such a retort is 920 days; while that of a brick retort is 1385 days. Assuming the retorts to be charged every six hours with 6 cwt. of coal, the bed of seven fire-clay retorts will carbonize during its lifetime 7728 tons, and the brick retorts 11,634 tons. The cost of the fire-clay setting, therefore, works out to 1¾d. per ton

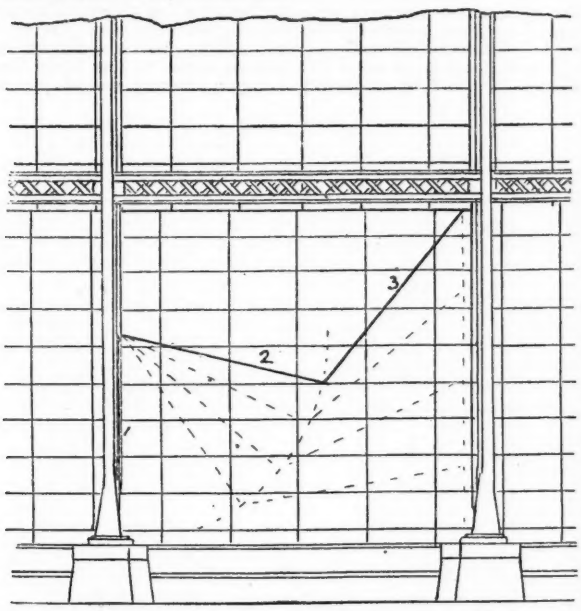
carbonized, and of the fire-brick setting to 1½d.—a clear saving of ¼d. per ton, or a total saving of £12 2s. 4d. during the life of the bed.

Another great advantage of brick retorts is that their construction renders them very much less liable to leakage than fire-clay retorts—the joints opening out when contraction takes place owing to the furnace being let down, and closing up into their proper places when it is again put into action; whereas the fire-clays will, in similar circumstances, crack very irregularly, and pieces will sometimes drop out. The brick retort is also much more easily repaired than the fire-clay; and it is quite possible to renew the two bottom retorts of a setting and the bottoms of the three middle retorts without taking down any fittings such as ascension-pipes, &c.—all materials being brought in through the furnace-hole.

The only advantage of the fire-clay over the brick retort is that the former requires less fuel, owing to it being only 3 inches thick, while the brick retort is 3½ inches. The extra fuel is, however, a very small item; and it is principally required in the first heating up of the setting.

PREVENTING FREEZING OF GASHOLDER CUPS.

The cold weather with which the past week opened doubtless reminded many gas managers that the season is approaching when they will probably have to contend with difficulties arising from the freezing of gasholder cups, and the other attendant troubles of winter, unless they take early precautions to guard against frost. With the view of assisting any of his brother managers who may have been placed in a dilemma in previous severe weather, Mr. F. M. Harris, the Engineer and Manager of the gas and water works of the Barry District Council, has sent the accompanying illustration, showing the method he has adopted with perfect success, during the past two or three winters, to prevent the freezing of the cups of a double-lift gasholder 80 feet diameter, with a rise and fall of about 48 feet—that of the lower lift and cup being, of course, about half this. Having had some trouble with flexible steam hose and other appliances, it occurred to him that the end could be attained with ordinary lengths of ¾-inch wrought-iron steam tube; and the idea was almost immediately carried out.



The system will be understood after a moment's glance at the above illustration. It consists of three pipes. No. 1 is carried up alongside of, and secured to, one of the standards at a height of about 16 feet above the tank-level, with a wheel valve at the bottom end, handy for adjustment at the ground-level. Three joints are, of course, used—one at the upper end of pipe No. 1, another at the junction of Nos. 2 and 3, and the third at the cup-level, where a bend dips below the surface of the water about 3 inches, and is turned either to the right or the left horizontally, to cause circulation. The dotted lines show the positions the arms Nos. 2 and 3 assume during the complete rise and fall of the holder. Though the joints used are merely elbows or bends, there is practically no leakage of steam; the back-pressure being so small from a dip of 3 inches. A little condensed hot water drops occasionally from the junction of the two arms; and as this falls into the gasholder tank, it is an advantage rather than otherwise. A small pad is secured at the back of the pipes to prevent rubbing, should the wind at any time cause them to come in contact with the holder.

In forwarding the arrangement for publication, Mr. Harris says that anyone who thinks it is likely to prove useful is quite at liberty to adopt it.

REGISTER OF PATENTS.

Water and Producer Gas Plant.—Newton, H. E., a communication from R. N. Oakman, of Greenfield, Mass., U.S.A. No. 13,019; July 5, 1895.

According to the specification filed with the application for this patent, the invention has reference to that description of plant which is used for making water gas and producer gas, or a combination of water and producer gas; and it consists partly in the general arrangement of extremely simple plant (a plant equal to furnishing gas up to 200-horse power being contained in a floor-space of 11 ft. by 25 ft.), and partly in various details of construction of some of the parts.

In carrying out the invention, a double generator is used, which preferably consists of a large chamber divided into two parts by a vertical partition wall, and having a common feed-hole. Each compartment has a grate, an ash-pit, and suitable connections below the ash-pit, with a common exhaust-pipe, and also air and steam inlets, as is now well understood. The exhaust connections are provided with water-cooled valves, suitably operated; and the exhaust-pipe is connected with a single boiler or cooler, in which the steam used in the process is produced. From this apparatus, the hot gases flow to a second and similar apparatus, used as a feed-water heater. They then pass to a wet scrubber; thence to a dry scrubber; and they are finally driven by an exhauster, in a purified state, into a gasholder.

Such an arrangement, it is claimed, is superior to those usually employed, as the valves heretofore have been placed beyond the boiler or cooler—that is to say, away from the generator—in which case the boiler has had its tubes filled with steam during the water-gas run.

In operating the apparatus, both exhaust-valves will be opened; the valve between the exhauster and the gasholder will be closed; and the valve of the smoke-stack will be opened. The top or charging door to the generators will also be opened. A fire in each generator having been kindled, and well burnt up, the exhauster is started; and the fire is blasted downwards until the required temperature is obtained in both fuel-beds. The stack-valve is now closed; the gate to the holder is opened; and the exhauster-valve on generator No. 1 is shut. The top or charging doors are also closed. An interlocking lever, which controls the air and steam valves, is operated so that air and steam are admitted to the bottom of generator No. 1. The air and steam are taken (by the draught of the exhauster) up through generator No. 1, and the resultant gases down through generator No. 2; then through the boiler, feed-water heater, and wet and dry scrubbers, to the exhauster; and thence delivered to the gasholder. After a few minutes' run, depending upon the fuel and the condition of the fuel-bed, as well as the quality of gas desired—the operation is reversed. The valve on No. 1 is closed, and that on No. 2 opened; and the air and steam valve lever is thrown over, so as to admit air and steam to No. 2 generator. This may be repeated many times before a second downward blast with the charging-doors open.

As it is necessary that the operator shall be prevented (by carelessness or otherwise) from admitting air to the bottom of No. 1 when valve No. 1 is open, because this would take air and steam away to the boiler, &c., and an explosive mixture of gases would be formed, special valve-operating mechanism with a locking device is provided, so that he cannot open valve No. 1 while the air is on that side. He must throw the air-lever over to unlock the valve-rod of No. 1; and before this, he must close valve No. 2. Means are also provided to allow of both valve-rods being sustained with an open gate when blasting or exhausting down through the charging-doors. The valve working must, says the patentee, be beyond any chance of the operator making a mistake—indeed, he must be prevented from throwing open the wrong valve. The air and steam valves are operated by the same stem; and the amount of steam admitted to the bottom of the generator can be regulated by a valve on the steam-supply pipe.

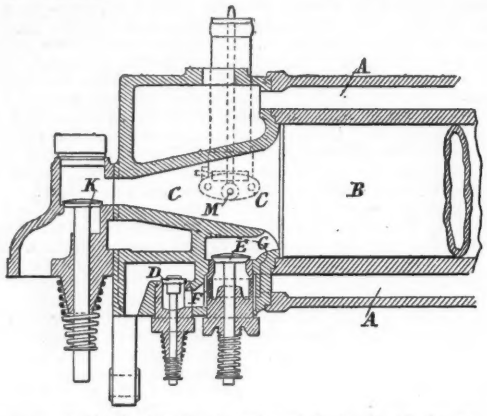
This plant can be operated for making (1) producer gas without steam; (2) a mixed gas, using as much steam with the air as can readily be decomposed; or (3) a pure water gas, by admitting steam only. In operating the ordinary down-draught generator, the steam is admitted at the bottom; and the resultant water gas is taken away at the top of the generator. Unless the coals at the top of the fuel-bed are well distilled, the water gas carries away a large amount of tar, which usually happens; and the effort is made to run a fire hot at the top. With many English coals, this causes trouble, and a low fire-bed in consequence. With the double generator, however, it does not matter if the coal at the top of each fuel-bed is fresh, as the hydrocarbons must pass down through one fuel-bed; and the gas goes away from the bottom of the generator free from tar, and also enriched by the distillation and gasification of the fresh coal at the top.

The exhaust-valves consist of hollow circular castings, faced on one side, and provided with means by which they are kept up to their seats when closed. This casting is connected with two pipes, which project through stuffing-boxes, and into other tubes, which serve respectively as water inlet and outlet tubes. By these means, cold water is always passing into the valve, so as to keep it cool, and the water warmed by contact with the parts is passing out. The valve-seat is also made hollow, with suitable inlets and outlets for water; and a constant stream of cold water is continually passing through. The chamber in the valve is provided with a central partition, which ensures constant movement of the water. The valve is of the slide order, and is moved by a rod attached to a boss on the edge. The valve-rod extends upwards above the operating-floor, and through one of a pair of boxes carried by standards on the floor; and it is pivoted to a hand-lever, by which the rod is raised when required. The rod is notched to catch on a pin, so that it may be held up, when the valve is to remain open. The valve-body consists of a box having a central partition, and at either end flanges, by which it can be bolted to the ends of the air-tube, which are connected with each generator respectively. The top of the box is faced to make a valve-seat, and has two suitably shaped parts set at an angle of 45° to the centre line. On the top of this seat is secured the valve, which consists of a disc having two correspondingly shaped ports on opposite sides of, and at right angles to, the centre line. This disc is keyed on the rod; and according as the rod

is turned to the right or left, so one or other of the valve-ports is brought opposite its corresponding port, and air will be allowed to rush in, under the influence of the exhauster. At the same time, steam will be admitted with the air; and both will pass up and through the incandescent fuel in the generator.

Gas-Engines.—Bickerton, H. N., of Ashton-under-Lyne. No. 20,705; Nov. 2, 1895.

This invention relates to gas-engines of the "Otto" cycle type, and has for its object "more efficient means for ensuring the correct explosive mixture of gas and air within the cylinder, and also the more effective clearance or isolation of the residuum of foul gases or products of explosion therefrom."



The engraving is a longitudinal section of the back end of a gas-engine cylinder, provided with apparatus arranged according to this invention. A is the cylinder, and B the piston, which is shown at or about the extreme of its back stroke; while C is an elongated or tubular recess. D and E are the gas and air valves respectively, with spaces communicating by passages F. Through these valves, gas and air are drawn into the chamber G, near the front end of the recess. The outlet of the chamber is, by preference, directed towards the interior of the cylinder, as shown; but the gas and air valve may, if desired, have separate openings into the cylinder, at or about the point shown. The piston makes its forward stroke, to admit the charge into the cylinder; and on the return stroke it compresses the mixture of gas and air, and the residuum or dead gases are driven thereby into the recess C. At the same time, the exhaust-valve K is opened for a short period; and, in consequence, the residue of spent gas not ordinarily exhausted is driven out of the chamber and through the exhaust passage, leaving a nearly pure mixture of combustible gas behind the piston. The firing is accomplished at the inlet M, near the front end of the recess C, as shown. The explosion having taken place at the next outward stroke, and the gas and air valves remaining closed, the exhaust-valve opens on the return stroke, and the cycle of operations is completed.

Controlling the Supply of Gas to Burners.—Hardingham, G. G. M., of Fleet Street, E.C. No. 21,364; Nov. 11, 1895.

This invention relates to means specially (but not exclusively) applicable to gas brackets, pendants, and the like, for facilitating the instantaneous restriction of the supply to a predetermined amount or its entire interception; the one or the other result depending upon whether the plug be turned "home" in the one or in the other direction. According to one mode of accomplishing this purpose, the patentee forms chases in the external surface of the plug and the internal surface of the shield—arranged in such a manner that, in one "off" position of the plug, the supply is entirely interrupted, while in the reverse "off" position of the plug, the chases form a bye-pass which allows sufficient gas to go forward to support a small pilot flame.

Draught Screen for Incandescent Gas-Burners.—Warry, J., and Arculus, G. N. & E. A., of Birmingham. No. 2075; Jan. 29, 1896.

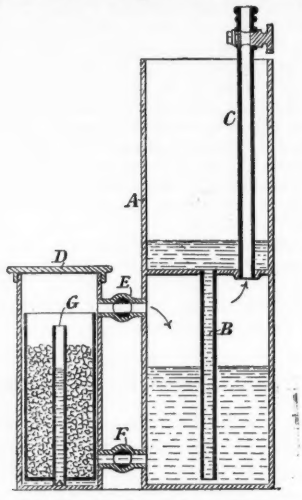
This invention has for its object to provide means whereby the breakage of the glasses or chimneys of incandescent gas-burners is prevented, when such breakage is caused by a current of cold air passing up the chimney after the gas has been extinguished. To effect this, the patentees make, preferably of glass, a cup or bulbous shaped attachment, to be fitted at or near the lower end of the chimney, in such a manner as to prevent the cool air from passing up the chimney—thus allowing it to cool gradually when the gas is extinguished. An illustration of such an arrangement was given *ante*, p. 666.

Generating Acetylene Gas.—Webb, G., of Shepherd's Bush, W., and Kelly, J. W., of Finsbury Pavement, E.C. No. 5905; March 17, 1896.

This invention relates to the automatic generation of gas by means of a head of water contained in a centre partition gasholder, acting upon calcium carbide when the gas falls below a certain pressure.

In the illustration, A is a gasholder, divided into an upper and a lower chamber by the partition fitted with the central tube B and a gas-outlet pipe C. D is the chamber containing the carbide holder, provided with a central tube G open at both ends. This chamber is fitted with a cover, for the purpose of filling the holder with calcium. E is the gas connection between the gasholder and the chamber D, and F is the water connection.

The operation is as follows: The cocks of the connections E F being turned on, the water in the upper part of the holder passes down the tube B, and through F into the chambers D, from whence it passes up the tube G and overflows on to the carbide. This causes generation of gas, which passes through the connection E into the holder, where it acts upon the surface of the water therein, so as to force it up the tube B into the upper part of the holder. The gas then passes away by the pipe C; and as its pressure decreases, the water in the



upper part of the holder again descends, until it overflows the tube G to generate fresh gas. This action is automatically repeated as long as there is a sufficient quantity of calcium carbide to create fresh gas.

Lighting and Heating Apparatus.—Fraser, P., of Brooklyn, U.S.A. No. 11,855; June 1, 1896.

This invention has mainly for its object the construction of a burner for lighting and heating purposes, although it also refers to the provision "of a simple and convenient arrangement, whereby the elevation of the usual canopy radiator of a lamp and the lamp itself can be altered at pleasure."

Fig. 1 is a vertical section and a plan of a gas-burner adapted for lighting purposes. Fig. 2 is a vertical section and a plan showing the same burner adapted for heating.

The burner (fig. 1) consists of a hollow chamber A, preferably made somewhat flattened at its upper and under sides, and which is provided with an open downward extension and an upward extension or tubular part. Secured concentrically within this tubular part is a tube with a flat outer flange at its lower end; and connected to this flange is a branch for the inlet of gas. The upper inwardly flanged part is

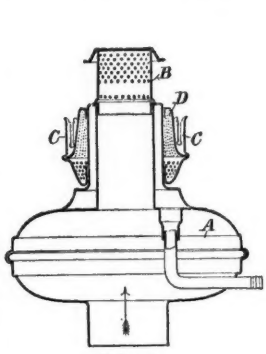


Fig. 1.

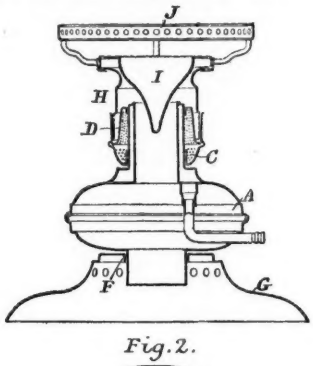
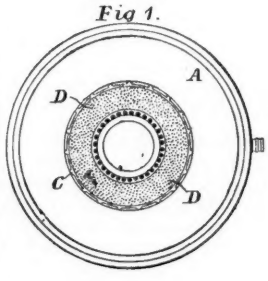
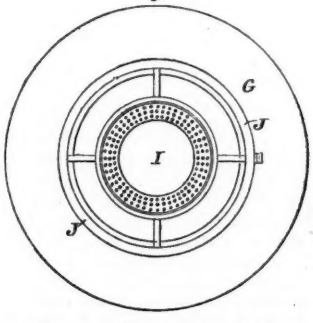


Fig. 2.





perforated with numerous holes; and fitted on the top of the tube is a cylindrical spreader B, perforated with holes, and provided with a cap. Fitted round the tubular part is the usual gallery C; and inserted within the gallery is a perforated conical ring D, which extends from the bead of the gallery up to about the level of the perforations, where it is bent inwards, so as to fit on to the tubular part of the burner. A glass globe or funnel is, as usual, fitted on the gallery.

With this construction of burner, gas from the inlet-pipe enters into a small chamber, and then passes up to the perforations, where it issues in the form of an annular flame. The gas in its passage upwards is heated by hot tubes; and an induced current of air passes from below, as indicated by the arrow, into the large air-chamber A (which, being made of copper or other good conductor, is, while the lamp is burning always hot), where it becomes heated. The now hot air passes up the tube shown, and issues out through perforations in the spreader B;

and while promoting combustion, at the same time spreads out the annular flame. An outer current of air also passes up through the holes in the gallery, and through the perforations of the metallic cone D, to the flame. This conical ring (while by its conductivity heating the air passing through it) also, at the same time, regulates the draught, and gives a regular distribution of air around the flame.

In fig. 2, the lower part of the chamber A is set into an opening F in a hollow metal stand or pedestal G, which is provided with air-inlet orifices. The spreader B is removed, and a top of peculiar construction fitted in the gallery C in place of the lamp-globe. This top consists of a metal (preferably copper) mixing chamber H, having an outer cylindrical wall of different diameters at different parts, and which is shaped with a constricted neck part, above which it flares outwardly, and of an inner wall consisting of an inverted cone I, made with a perforated flange to serve as the top of the chamber. There are, preferably, three rows of perforations in this flange as shown; and as will be seen, the inverted conical wall is not regular in shape, but appears in section as curved. Fitted on top of the chamber is a ring J, supported by arms, and made with perforations in its periphery. The pot to be heated is placed on the ring.

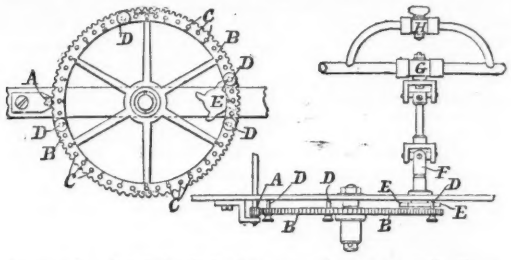
In this arrangement, a very perfect bunsen or blue flame is said to be produced at the perforations. Air, as before, passes from the chamber A, and mixes with gas from the holes and air from the gallery C and cone D; and this mixture passes up between the inverted cone I and the outer cylindrical wall, and finally issues at the outer orifices. The mixture of gas and air is highly heated, before combustion, by the cone I and the cylindrical wall. The arrangement of constricted neck and the inverted cone will, it is claimed, give a very narrow annular and wedged-shaped passage for the gas and air to passthrough, and thus prevents lighting-back.

Turning Gas and Other Taps by Clockwork.—Smith, F. S. and J. H., of Derby. No. 12,725; June 10, 1896.

This invention is more especially applicable to turning the gas on and off in connection with the illuminated dials of public clocks.

The illustrations show a side elevation and plan of the apparatus applied to the purpose stated.

The small wheel A represents the centre wheel in a clock, which revolves once an hour. A large toothed wheel B gears with A, and revolves once in twenty-four hours. In the rim of B are a number of holes C—say, for the sake of illustration, 48—each thus representing half an hour of time. Movable pegs D are secured in the holes



according to the time it is desired to turn the tap on and off. As the wheel B revolves, the holes are arranged to pass the four-armed piece or cam E; and thus, when a hole arrives with a peg in it, the spindle F is moved one-quarter of a revolution. This opens the tap G; and the next peg which comes in contact with an arm of the cam E will turn the plug of the tap another quarter of a revolution, and close the tap. The tap H is to allow a small supply of gas to pass to the burners during the time the main supply was turned off at the tap G. For the sake of illustration, the holes in the rim of the wheel B are shown numbered according to the hours of the day they represent; and four pegs are inserted. It will thus be seen that the gas would be turned on between the hours of 5 and 7 in the morning, and between 5 and 11 in the evening.

Incandescing Mantles for Lighting Purposes.—Caro, N., and Saulmann, W., of Berlin. No. 14,448; June, 30, 1896.

The patentees claim to have proved by their experiments that the emitting capacity of incandescent mantles is not based on the existence of a compound of cerium-thorium oxide, but that the presence of cerium, in other than oxide form, is capable of bringing the oxide of thorium, which in itself does not emit light, to incandescence. If, for example, silicate of cerium is suspended in a solution of nitrate of thorium, and the fabrics for the mantles be impregnated therewith, then, after calcination, a skeleton will remain which is of great incandescing power, although the nitrate of thorium alone, applied in the same manner, did not give an incandescing body. As it is obvious that silicate of cerium will not become decomposed on incandescence, this proves (say the inventors) that the presence of a compound of cerium is capable of imparting incandescing power to the thorium skeleton, even when it does not form oxide after having been calcined. But the application of silicate of cerium is impracticable, as, by the mere suspension of it in a solution of nitrate of thorium, it is impossible to obtain the uniformity which is indispensable for the manufacture of incandescing bodies; and the production of silicates upon vegetable fibre itself is not practicable, because of the presence of alkalies, which has to be avoided.

According to the present invention, it is proposed to employ compounds of cerium which are durable when incandescent, and yet can be obtained by solution in a crystalline form upon the fibre itself. These compounds consist of trivalent elements, such as arsenic, antimony, bismuth, boron, or vanadium—all of which have been found suitable. For example, if a solution of nitrate of cerium be mixed with a solution of arsenic acid, the mixture will remain clear. If, however, it is boiled or steamed, the cerium arsenate will separate as a white crystalline precipitate.

With arsenic, the production of the incandescing bodies is as follows: The fabric for the mantle is saturated with a solution of arsenic acid and nitrate of cerium, and dried, whereby the arsenate of cerium separates in an insoluble form. After this, the fabric is saturated with thorium nitrate, dried, and calcined. In this way, a mantle is obtained which consists of thorium oxide and cerium arsenate. If boric acid (or acids of the other bodies mentioned) be employed, the treatment is the same. Instead of boric acid, arsenic acid, &c., other compounds of these elements may be taken, if they have the property of depositing from solutions in a crystalline form.

The mantles produced according to this method are said to be very durable, as the arsenate, borate, &c., contained therein, being crystalline, renders them more cohesive than the amorphic powdery oxides. For the same reasons, they are much less influenced in their incandescing power.

Gas-Engines.—Heys, W. G.; a communication from J. J. Heilmann, of Paris. No. 15,197; July 9, 1896.

The claims for this invention (relating to both gas and oil engines) are for: 1. An explosion engine of the four-cycle type, in which equilibrium of the reciprocating parts is obtained by the use of six cylinders and cranks, and in which uniform motion is secured by a succession of six explosions at regular intervals during two revolutions of the crank-shaft. 2. In an explosion engine of the four-cycle type, and in which the rate of explosions is determined, a method of, and means for, obtaining one impulse or explosion for every 120° of angular motion of the crank-shaft.

Rendering Blast-Furnace Gases Available for Working Gas Motor Engines.—Thwaite, B. H., of Great George Street, S.W., and Gardner, F. L., of Old Jewry, E.C. No. 15,684; July 15, 1896.

In order to render blast-furnace gases available for the production of motive power in an internal combustion or gas-motor engine, they have to be cleared from matters suspended in them, and regulated in pressure and volume to suit the demand. The present invention relates to apparatus for the purpose, consisting of dust depositing, cooling, washing, scrubbing, and filtering apparatus, some of them preferably arranged in duplicate, with valves for alternating their action, so that the blast-furnace gases can be passed through one set of apparatus while the other set is being cleared of the deposited matters. The gases are drawn from the furnace and propelled by a fan through the cleansing apparatus into a gasholder, from which they pass to the engine; a valve being provided to close the suction-pipe of the fan when the top of the furnace is opened for charging. A self-acting relief-valve is arranged to come into operation when the gasholder is fully charged, so as to allow of the escape of the surplus volume of gases. A water column and float are also provided, which makes electric contact to signal the reduction of pressure in the furnace when a tuyère happens to give way; so that the suction of the fan may be at once reduced or entirely stopped, in order to avoid the generation of explosive mixture in the conduits.

Gas and other Explosive Engines.—Blakey, G. G. and R. O., of the United States. No. 16,366; July 23, 1896.

The principal claims for this invention are: (1) The combination in a gas-engine of the piston and the cylinder having the gas-valve in one end, an air-supply valve and an air and gas exhaust-valve in each end, and the gas and air grooves formed in the cylinder (intermediately of its ends), and conducting the gas and air from one end of the cylinder to the other, past the piston and within the chamber of the cylinder. (2) In combination with such a cylinder, and a revolvable shaft arranged parallel therewith, a means of operating the exhaust-valve of the forward end of the cylinder. This consists of two or more cams arranged upon the shaft; and a double rocker arm pivoted or journaled to a suitable bearing, and connected at its upper extended arm to the stem of the exhaust-valve, and provided at its lower extended arm with a projecting pin or journal. The pin or journal extends parallel with, and above, the revolvable shaft; and loosely mounted thereon are two revolvable lifting wheels, one of which is adapted to engage with one of the cams at each revolution, and the other is adapted to be shifted in or out of contact with the other cam or cams.

Incandescing Mantles, and Processes for Manufacturing Them.—Voelker, W. L., Elizabeth, N.J., U.S.A. No. 17,194; Aug. 4, 1896.

This "new incandescing material" consists of an intimate combination of two or more of the alkaline metals or metals of the earths proper, in the proportion of their chemically combining weights; and the union is produced by the action upon an intimate mixture of the ingredients (in such proportions) of intense heat—such as that in an electric furnace. The material is preferably a union of calcium and magnesium—termed "magnesium calcite;" and it may contain a trace of other substances, to vary the tint of the light.

The material is prepared in the following manner: Suitable salts of the selected alkaline metals or metals of the earths proper, which are soluble in water and are easily decomposed by heat—such as the nitrates—are thoroughly mixed together in a finely powdered condition, and in the proportions of their chemically combining weights. For example, for making the "magnesium calcite," 163·7 parts by weight of calcium nitrate and 148·2 parts by weight of magnesium nitrate are taken. These are ground fine, mixed, and then dissolved together in distilled water. The solution should be made with the minimum quantity of water that will serve the purpose. When the nitrates have been dissolved, the solution is evaporated in a vessel heated up to a temperature sufficient for the decomposition of the nitrates, which is completed at a red heat. The mass which results will produce a pure white light. If it is desired to give a yellow tinge to the light, (say) one-eighth of one per cent. of cerium nitrate is added to the powdered substances, and dissolved, and evaporated with them as described; or if a ruddy tinge is desired, the same quantity of chromium nitrate is added.

After evaporation, the mass is transferred to a furnace composed of pure calcium oxide—illustrated in the specification—and is therein fused by the electric arc or other means. The operation of fusion

forces the molecules of the substances into intimate union, and results in the new incandescing material. The lump or cake is next ground to impalpable powder, and then combined with suitable viscous materials, so as to produce a tough mass, in the following manner: A mixture is formed of one part camphor and two parts gun cotton by weight. These are dissolved in forty times their weight of oil of cassia. To the solution are added (drop by drop) four parts by weight of the strongest sulphuric acid; the solution being constantly stirred as the reaction takes place. The completion of the reaction is indicated when the whole has doubled its bulk. Then the solution is cooled to normal temperature. The mass then has a viscous constituency; and it is used in the proportion of one part by weight to three parts of the powdered magnesium calcite. The powder is mixed into the viscous mass, and then thoroughly incorporated with it by passing the whole between hot rolls. This not only thoroughly incorporates the chemicals with the viscous mass, but also consolidates and toughens the product. After being thoroughly rolled, the product is put in a metallic chamber, subjected to great pressure, and while being pressed is heated to a temperature of about 110° Fahr. for about 24 hours. The final product is very tough, and can be rolled into sheets or drawn into threads, as through dies, and then formed into mantles; or the threads can be knitted to form them. The viscous material carbonizes when the mantle is burned out; and there is left a mantle consisting of the oxides of the chemicals used.

APPLICATIONS FOR LETTERS PATENT.

22,068.—Luchaire, H. L. A., "Manufacture of acetylene gas. Oct. 5.

22,122.—Mason, S., "Improvements in bunsen burners." Oct. 6.

22,153.—Imray, O., "Gas-stoves." A communication from V. W. Blanchard and E. K. Stow. Oct. 6.

22,185.—Morris, C., "Burners for incandescent gas lighting." Oct. 6.

22,207.—Ball, A., "Improvements in gas and similar motors." Oct. 7.

22,212.—Phillips, E., and Vallat, F. W., "Internal combustion engines." Oct. 7.

22,274.—Chiverton, E., "Lighting and extinguishing gas-lamps." Oct. 8.

22,286.—Wand, W. H., "Gas or vaporized oil driven locomotives or cars." Oct. 8.

22,326.—Krieger, G. F., "Electric apparatus for lighting and extinguishing gas-jets." Oct. 8.

22,347.—Winkler, H., "Incandescent gas light arc lamps." Oct. 8.

22,348.—Winkler, H., "Fittings for incandescent gas-lamps and the like." Oct. 8.

22,359.—Maddock, E. H., and Jones, W., "Acetylene gas generators and gasholders." Oct. 8.

22,395.—Crawley, C. W. S., Soames, A., and Drysdale, C. V., "Method of obtaining motion from the expansion of gas." Oct. 9.

22,398.—Robinson, C. T., and Prescott, S. J., "Atmospheric gas-burner." Oct. 9.

CORRESPONDENCE.

[We are not responsible for the opinions expressed by correspondents.]

The Self-Enrichment of Coal Gas.

Sir,—In his letter in the "Journal" for the 3rd inst., Mr. Shadbolt says that purified or holder gas for enrichment in his experiments "proved a practical failure," and that a perusal of his paper read at Retford last month "along with the patent specification, will disclose the radical difference between returning holder gas" and gas found at the outlet of the washer. Before referring to what Mr. Shadbolt said in his paper about holder gas, I will relate my experiments with it, and the causes necessary to success.

I have been experimenting with holder gas since Oct. 26, 1892; and I am now experimenting with it, and successfully. The coal I am using is Wigan, costing 6s. 7d. per ton at the pit, without a particle of cannel in it; and, without using with it any cannel, or any other enricher than its self-enrichment, I am making 17-candle gas. To succeed thus, certain points are necessary: (1) To separate the tar and gas as soon as possible. I take the tar from one end, and the gas from the other end of the hydraulic. (2) To have the heats so great that not less than 10,000 cubic feet of gas per ton are made. I find that the greater the make, the greater the self-enrichment. (3) To pass the making gas into the condenser at a high temperature, and the holder gas at a low one—as low as possible, so that, like cold tar, it will take up the naphthalene that is being precipitated and in solution. (4) To hourly record the quantity of holder gas returned, and the quality of the distributing gas, so that, according to the bituminous quality of the coal, the quantity required to enrich may be ascertained and used.

In answer to correspondents who have written to me, I may add that, since October, 1892, I have not had any trouble with naphthalene in its solid form in the gas-mains, which proves that the naphthalene taken up is fixed by heat generated in the purifiers by chemical action.

Now, what did Mr. Shadbolt say in his paper about holder gas? On p. 546 of the "Journal," it is reported that he said: "The idea was to return thoroughly purified gas" (holder gas); "but as this would undoubtedly mean increased back-pressure on the purifiers in winter time, it was decided to tap the inlet side of the purifiers." This is the only reference that I can find. No mention is made there of any experiment of his with holder gas or of any "practical failure" of his with holder gas.

In the specification of March 6, 1896, and in the paper read at Retford, it is stated that the patentees proposed to convey a portion of the partly purified gas from a point varying with local conditions.

A copy of the "provisional patent protection" obtained "in June, 1895," would to me be very interesting.

Ormskirk, Oct. 12, 1895. John Martin.

LEGAL INTELLIGENCE.

COUNTY OF LONDON ASSESSMENT SESSIONS.

Sessions House, Clerkenwell, E.C.—Friday, Oct. 16.

(Before Mr. Loveland-Loveland and a Bench of Magistrates.)

East London Water-Works Company v. The Parishes of St. Matthew Bethnal Green, St. Leonard, Bromley, St. Mary, Stratford, and St. George-in-the-East.

The hearing of appeals from the last quinquennial assessment of the Metropolis was resumed to-day.

Mr. Barnes, who appeared for the Company in the above cases, stated that a settlement had been arrived at; the agreed figures being as follows: For the Company's property in the parish of St. George-in-the-East, £1680 gross value, £1370 rateable; St. Matthew, Bethnal Green, £6147 gross, £4967 rateable; St. Leonard, Bromley, £3116 gross, £2525 rateable; and St. Mary, Stratford, £3138 gross, £2540 rateable. The rateable values appealed against were: St. George-in-the-East, £1500; St. Matthew, Bethnal Green, £5215; St. Leonard, Bromley, £2625; and St. Mary, Stratford, £2591.

Mr. W. C. Ryde, for St. George-in-the-East, St. Leonard, Bromley, and St. Mary, Stratford, acquiesced in the statement.

The Clerk to the Court subsequently stated that he had received an intimation from the parish authorities in the fourth case that they also agreed to the figures stated; and the Chairman announced that, on the adjournment of the Court, he would initial the figures agreed on in the books, which would then become operative.

East London Water-Works Company v. The Assessment Committee of the Parish of St. John, Hackney Union.

Mr. Littler, C.B., Q.C., Mr. Cripps, Q.C., M.P., and Mr. Barnes appeared for the Company; Mr. Balfour Browne, Q.C., and Mr. Ryde represented the Assessment Committee.

Mr. Littler, in opening, said the respondents had taken a legal point which, if there was anything in it, would materially shorten the inquiry. From the "case" of the respondents, the Court would see that in the valuation list for the parish of St. John, Hackney, the Company were assessed at £20,000 gross and £15,223 rateable; and that about June 24, 1895, they gave notice of objection to this increased assessment of £15,223 rateable value, and claimed that it should be reduced to £13,170. But they made no objection to, and claimed no reduction of, the gross value stated in such list. This was not quite accurate. On Sept. 24, Mr. Marshall, the Valuer to the Company, attended before the Committee, and stated that he had found it necessary to amend his valuation by altering the gross value to £16,773, and the rateable value to £12,515. The respondents went on to say that the appeal must be dismissed, in so far as it sought to reduce the gross value, on the ground that the appellants (not having given notice of objection to the gross value entered in the valuation list) were not "aggrieved by any decision of the Assessment Committee" with regard to the gross value, within the meaning of section 32 of the Valuation (Metropolis) Act, 1869, and therefore were not entitled to appeal under that section. He could not quite understand this. To get at the gross value, they ascertained the rateable value and added a percentage according to the class of property under the Act.

The Chairman: Is it not, Mr. Littler, the case you argued many years ago at Southampton?

Mr. Balfour Browne: Yes, sir.

Mr. Littler: No. There the notice of appeal was not against the gross, while here it is. They do not object to an appeal against the gross; all they say is that we are not "aggrieved" within section 32. But he urged that the Company were "aggrieved" by the Committee refusing to reduce the rateable value and also the gross, on the objection which Mr. Marshall made. It was not necessary that the notice should contain the same objection that they might afterwards make. What Mr. Marshall did was what everyone was entitled to do—amend the objection by stating what the gross was; and he amended his objection as to the rateable value, by giving a smaller figure than that in the notice. The actual figures he placed before the Committee were £16,673 gross value, and £12,500 rateable. He (the learned Counsel) could not understand why the Company were not "aggrieved" by the Committee refusing to accept these figures. The Southampton case, and another one like it at Carlisle, were decided under the ordinary poor law; and, further, as everyone knew, out of the Metropolis there was no fixed scale of reduction from the gross to the rateable value. Therefore these cases were very different from the present. Mr. Justice Field, in the case of the Great Eastern Railway Company, held that it was not necessary to give any figures in going before the Assessment Committee. The learned Counsel submitted, in conclusion, that the case must go on, and be heard on its merits.

Mr. Balfour Browne, in support of the objection, urged that the present point was the same as was settled in the Southampton and Carlisle cases—viz., that unless an appellant gave notice to the Assessment Committee that the gross valuation was wrong, he (the appellant) could not be heard in this Court to say that the gross was wrong. Mr. Littler held that Mr. Marshall, having found that the Secretary to the Company (Mr. I. A. Crookenden) had made an error, went before the Committee and tried to rectify it. But that was not possible; the Act distinctly stating that all notices were to be in writing or print.

Mr. Littler: Mr. Marshall handed in to the Assessment Committee a statement of the gross in writing.

Mr. Balfour Browne: That is not a notice. The notice that must be given must be one objecting to a particular thing. Passing on, he pointed out that the term "rateable value" meant "the gross value after deducting therefrom the probable annual average cost of repairs, insurance, and other expenses." His learned friend, in the Southampton case, argued that if there was no objection to the gross they could not go beyond it. This was the view adopted then; and all that was now left for the Court to consider was whether the deduction

made from the gross value was sufficient. Under section 11, "The notice of objection shall specify the correction which the objector desires to be made." The only notice the Committee had was that the Company desired the rateable value to be altered; and the Committee had deducted actually more than was asked. As regarded the Great Eastern case, it was with a view to meet this difficulty that section 11 was enacted; so that this case was valueless as a precedent. His learned friend also urged that the scale in the third schedule of the Act made this case an extraordinary one; but by express enactment, waterworks were removed from the operation of the schedule. In conclusion, he submitted that the Company could not be heard, as they had not asked the Assessment Committee to alter the gross value. They could only apply for a reduction of the rateable value. But if the gross stood, the only question, in view of the Southampton and Carlisle cases, was how much was to be deducted. In this connection, he pointed out that the Assessment Committee had already remitted more than they were asked to do. He therefore held that the appeal ought to be dismissed.

The CHAIRMAN (after retiring and consulting with his colleagues) said: We have given this point our most careful consideration; and we are of opinion that, inasmuch as the statutory notice of objection related only to the rateable value, we must ask the appellants to confine their attention to that—taking the gross at £20,000. If they can show us by statutory deductions and other matters that they can reduce the gross to lower than £15,223 rateable, we shall be very pleased to hear the case.

Some discussion followed; and eventually Mr. Littler asked, and obtained, permission to put Mr. Marshall in the box, to show that the Committee accepted the statement which he put in in writing, and that they heard the objection. The latter fact, together with the fact that the other side were present, would, he contended, amount in law to a waiver of notice of objection.

Mr. *W. Marshall* then entered the witness-box, and stated that he attended before the Assessment Committee for the Company. He believed he offered to read the notice of objection; but they did not seem to want it. He then went into the merits of the case, and handed in to the Committee a copy of his valuation, showing what he made the gross estimated value and the net rateable value. He had a long discussion with the Committee, and afterwards with the Clerk and Valuer to the Committee; but he was unable to come to an agreement, and the Committee declined to make any alteration in the gross.

The CHAIRMAN: And no amended notice was handed in by you?

Witness: I had no opportunity of amending it.

Mr. LITTLER said the decision of the Court would cause him to present an entirely different set of figures from those already prepared, because they would have to show that from the now fixed gross value they should make such deductions as would upset the figure of the other side as to the rateable value. This could not be done on the moment. He therefore asked for an adjournment without fixing a day.

After some further discussion, this course was adopted; the question of costs being also adjourned.

A Water Company Fined for Deficient Supply.

At the Chepstow Petty Sessions, on the 6th inst., an adjourned summons was heard against the Chepstow Water-Works Company, for neglecting to furnish Mr. E. Hartland, J.P., of Hardwick Court, Chepstow, with a proper supply of water for domestic purposes from Aug. 21 to Aug. 30, and from Sept. 1 to Sept. 3 inclusive, such supply having been paid for. A previous summons was heard on the 8th ult., when the Company were fined £13 12s. 6d. and costs. The plaintiff gave details as to the failure of the supply on the days in question. It appeared that the water was conveyed to the plaintiff's house by a double service of pipes in connection with the Company's main. The pipe served a large tank, the house, laundry, some cottages, and a farm; and the supply was regulated by stopcocks. Plaintiff described the positions of these, and gave details of the supply from day to day during the period in question. One was put inside his wall; and this he said he had not touched, though he had altered the others occasionally. Mr. Parnall, who appeared for the Company, handed in a plan showing the situation of the water-pipes, and pointed out to the Bench that every part of Mr. Hartland's premises was supplied from the principal service-pipe. When the plaintiff closed certain stop-taps he would have water all over his premises. There was a big service-pipe attached to the Company's main in the Newport Road, and it crossed the property of two gentlemen and a road to Mr. Hartland's. For this pipe, the Company were not responsible; it did not belong to them, and they had never repaired it. Mr. Hartland was the owner of the pipe; and when the Company had put the water into their main in the Newport Road, they had done all they had to do, and were relieved of any further responsibility. Mr. Charles Evans, the Secretary of the Company, stated that by closing certain taps he found plenty of water on the estate. He attended at Hardwick Court every day during the period mentioned in the summons, except Sundays, and each time he found water going into the big tank. But the outlet was larger than the inlet; and so the water ran out as fast as it went in. If the outlet had been closed, there would have been sufficient water. In reply to the Bench, witness was understood to say that there was water in the Company's mains all day. John Henry Lewis, an employee of the Company, deposed that during the period mentioned he opened the mains not later than eight o'clock in the morning, and closed them at about eight at night. The Bench came to the conclusion that Mr. Hartland had proved his case; and therefore they must fine the Company £1 for each day, with costs (£13 10s. 6d. in all).

Payment of a Long Outstanding Water Account.—An amusing matter was brought under the notice of the Dover Corporation last Wednesday. The Mayor announced that he had received a letter, addressed to the Chairman of the Water-Works Committee, enclosing 15s.; the writer stating that when he left Dover twenty years ago, he owed 7s. water-rate, which, with the interest up to the present time, would be about the amount sent.

MISCELLANEOUS NEWS.

DUNFERMLINE GAS-WORKS ARBITRATION.

Edinburgh—Friday, Oct. 9.

(*Before Mr.* H. E. JONES, M.Inst.C.E., *and Mr.* W. FOULIS, M.Inst.C.E., *Arbitrators; Mr.* J. SHIRESS WILL, Q.C., *Oversman.*)

The proceedings in the arbitration under the Dunfermline Gas-Works transfer were opened on the above-named day. During the forenoon, the sitting was held in the Clarendon Hotel; but the apartment proved too small, and the parties proceeded to the Balmoral Hotel, where the subsequent sittings took place. Mr. Jones was Arbitrator for the Company; Mr. Foulis, for the Corporation.

Mr. A. ASHER, Q.C. (Dean of the Faculty of Advocates), and Mr. KINCAID MACKENZIE appeared for the Company; and the Corporation were represented by Mr. T. SHAW, Q.C., and Mr. CLYDE.

The claim by the Company was as follows:—

In obedience to the order by the Arbiters, the Company hereby intimate that they claim from the Commissioners as the purchase price of the undertaking of the Company including all the rights, powers, and privileges, and all the lands, premises, works, and property of the Company, the sum of £140,000 sterling, subject to the following conditions:—

1.—The Commissioners shall take over the undertaking of the Company as at the 31st day of May, 1896, from which date the price shall bear interest at the rate of 5 per cent. per annum until paid.

2.—The Commissioners shall be held to have satisfied themselves as to the accuracy and propriety of the whole intromissions of the Company since the said date, and as to the terms of all contracts current between the Company and the consumers and all other, including the servants of the Company; and they shall relieve the Company of all claims and obligations against the Company arising out of, or connected with, the said contracts.

3.—The Commissioners shall acquire right to all accounts due to the Company and all money belonging to the Company in bank or on hand, and also right to enforce all contracts current with the Company so far as the Company are enabled to confer such a right upon the Commissioners.

4.—The Commissioners shall pay the whole existing debts of the Company, and they shall be held to have satisfied themselves as to the amount of the sum; but there shall be excepted from this obligation the sums due under bonds granted by the Company, amounting in the aggregate to £11,900. These bonds the Company will discharge as they fall due.

5.—The Commissioners shall acquire the whole property and other assets of the Company, subject to feu-duty and other burdens thereon.

6.—The Commissioners shall pay all the expenses incurred by the Company of and incident to the arbitration.

The answer of the Corporation was that the amount claimed was greatly in excess of the value of the Company's undertaking; and that the conditions specified in the claim were unusual and unreasonable. It was agreed to proceed with the Company's case first.

Mr. ASHER said that, before the proof proceeded, he should like to refer to the date when the undertaking was to be taken over. He rather thought this would require to be matter of arrangement. The notice was served upon Feb. 18, 1896; and the claim of the Company was that the Corporation should take over the undertaking as at May 31, 1896, from which date the price should bear interest at 5 per cent. per annum. The reason why this date was taken, was that it was the date of the annual balance. It would be convenient at the outset to know to what date the claimant's witnesses were to be brought down.

Mr. SHAW said they were in a very difficult position. He quite agreed that it was expedient that some mutual arrangement should be come to, without troubling the tribunal. Their difficulty was, first, that entering at May 31 they should take over the current contracts and obligations of the Company. Upon this it would be expedient, before they bound themselves to an arrangement of any kind, that they should know what they were doing; but they had been excluded—he had no doubt there was very good reason for it—from all sources of information since May 31. He assumed that the Arbiters' award would not be issued until (say) November; and then they would take over a concern with obligations of which they knew nothing. Their idea was that they should have an opportunity for an inspection of the books, and a making up of such accounts as would show the state of the stock at the date of the award, as compared with the exact period of entry. In the second place, whatever happened, he must announce that the Corporation should strongly resist any period of entry being ante-dated upon the footing that they were to pay 5 per cent. interest upon the sum of the award. They should be glad to assent to any feasible arrangement; and he suggested that an opportunity should be given for some two persons to mutually inspect the books, and see how the matter stood.

The OVERSMAN suggested that May 31 should be accepted as the date of the transfer, subject to the Company giving the fullest inspection and access to their books. If this date were accepted, it followed that the business carried on after that time was for the benefit of the Corporation; and therefore the Corporation had a right to see every document, and to have the fullest inspection. If this should be withheld, then the Corporation might withdraw that date.

Mr. ASHER said his information was that no book had been asked for from the Company and been withheld, with the exception of the minute-book, which dealt with the way in which they were to meet this notice. He now offered, on behalf of the Company, to give the fullest access to everything, subject to the reservation that, until the present inquiry was at an end, they must withhold the proceedings of the Directors as to how to deal with this claim.

Mr. SHAW acknowledged that the Company had a right to withhold that.

The 31st of May, 1896, was then accepted as the date of tranfer, subject to the Corporation being satisfied with the disclosures of the Company in regard to their contracts, and to the reservation to the Company, in the event of May 31 being withdrawn by the Company, to present their figures for a substituted date.

Mr. *Alfred Lass* was then called in support of the Company's case. He said that the Dunfermline Gas Company was formed in 1828; and there was a new contract in 1871 for a period of 21 years. The capital

of the Company was declared to be £22,575, divided into 1290 shares of £17 10s. each. The Company carried on business under this contract until 1881, when it was registered under the Companies' Acts, under the style of the Dunfermline Gaslight Company, Limited. The shares of the old Company were held as cancelled; and the capital was fixed at £60,000, divided into 2400 shares, declared to be of the value of £25 each. He had prepared a table, which showed the position of the share capital as at May 31, 1871, and May 31, 1891. At the former date, the capital of the old Company stood at £8420; and on June 1, 1871, when the articles of co-partnery commenced, the shares were written up, and became £22,575. The shares numbered 848, at £17 10s. each, or £14,840. The difference between these two amounts was £6420; and he added that sum. The Company evidently argued that they were on the point of commencing a new term; and they thought the shareholders were entitled to all the various funds which had accumulated up to May 31, 1871. They therefore took the premiums (amounting to £2677) and insurance funds (amounting to £1345), and then added the increased value of the fixed plant account, to the extent of £2384, which was done under a valuation. Then there was £12 12s. of unpaid dividends, which the Company probably thought they would never be called upon to pay, and £30 difference of value upon some shares held by the Company. Therefore the £6420 was practically divided among the shareholders, by raising the shares from £10 to £17 10s.; so that on June 1, 1871, the share capital was declared to be £14,840. He had accordingly added £6420 to the capital of the old Company, making £14,840; and he had also added to the fixed plant account £2384. This made the net amount expended at June 1, 1871, £19,942. The Company carried on business till May 31, 1891; and then the capital was written up to the extent of £10,912 The share capital written up consisted of an increase in the value of the undertaking by £10,262; and the balance was made up of the insurance fund accumulated during the twenty years.

By Mr. FOULIS: The increase of £10,912 was practically based upon a structural valuation by the Manager; and the increase of £2384 was based upon a valuation of the old plant, buildings, and apparatus belonging to the Company, made by Mr. D. Laidlaw.

Examination continued: In the summary to his tables, it was shown that the total expenditure upon works, plant, mains, and meters came to £69,318. They gave credit for the sale of materials £3585, and depreciation written off to the extent of £16,071, which reduced the amount expended on the works and plant to £49,661. Then the capital was written up to the extent of £12,647, which made the amount expended on the fixed plant account at May 31, 1896, £62,309. He thought the principle upon which depreciation was charged was this, but they took sufficient to pay their dividends, and the balance of the profit and loss account had been practically transferred to the depreciation fund. The depreciation of £16,000 extended from 1891 to 1896. They had £1400 or £1500 in one year. Up to 1894 the Company carried on their business about a quarter of a mile distant from the present site. In August of that year new gas-works were constructed; and the business had been carried on in them since that date. He had been supplied with a number of statements prepared by Mr. J. A. Robertson, of Edinburgh. He had carefully examined and checked the figures in them, with the exception of the tables relating to gas consumed in the works. He should say that the accounts had been reconstructed by Mr. Robertson. The Company's accounts were not in the same order as the reconstructed ones. In the Company's accounts, the capital, revenue, and profit and loss net accounts were all together; and in the reconstructed ones, Mr. Robertson had taken the usual course in setting out the accounts by themselves, and afterwards the general balance-sheet. He had found the figures substantially correct. The calculations showed the usual percentages—gas sold, used in works, and unaccounted for. They had the total number of tons of coal carbonized. The dissection as between the amount of cannel, shale, and splint was of no consequence. Of the total quantity of coal carbonized, the Manager stated that he got 6¾ cwt. of coke for every ton. On that statement, they had 2471 tons of coke in 1895 and 2211 tons in 1896. The quantity used on the works for fuel was 24 per cent. in 1895 and 25 per cent. in 1896.

Mr. FOULIS: But that is simply an estimate?

Witness: Yes; it is of no value. Continuing, he said that, though there had been an increase in the quantity of gas sold, the number of consumers had decreased. In 1891, there were 3973 consumers; in 1892 there were 3949; and in 1896 there were 3851. During the year 1884, the Company got a grant of land in perpetuity, subject to a yearly rent or feu-duty of £69 7s. When the Company took possession of the land, they erected on a portion of it a new gasholder and a foreman's house, which occupied practically one-seventh of the whole. The yearly feu-duty of £69 7s. was charged by the Company to the revenue account, from 1883 to the present time. Six-sevenths of this feu-duty had been taken out of revenue; and down to the year ending May 31, 1890, the total amount arrived at was £403. This was carried direct to the profit and loss net revenue account. During the year ending May 31, 1891, there was a charge of £58 10s. to the revenue account in the statements before the Court. This sum had been taken out and transferred to the fixed plant account by Mr. Robertson. During the years ending May 31, 1892 and 1893, there were further sums of £58—making altogether £578 of feu-duties, which was part of a sum of £714 which Mr. Robertson had taken out of the revenue account and charged to the fixed plant account. During the years 1894, 1895, and 1896, the feu-duties had been charged to the revenue account in the statements, because during these years the ground was fully occupied by the new works. Mr. Robertson brought back from revenue to plant a proportion of the annual feu-duties applicable to the ground which was not occupied, capitalizing it as being the accumulated value of ground which was ultimately to be used for works. Witness was of opinion that the feu-duty of the whole, which had to be paid annually, was properly debited to revenue at the present time. They would see that this would affect the profits in the years 1891, 1892, and 1893 to the extent of £58 per annum. But it did not affect the revenue account after May 31, 1893 The next item as to which there was a question between Mr. Robertson and Mr. Millar (the Corporation accountant) was the sum of £58 for expenses, in connection with the sale of the old works. The Company turned the amount to revenue account; and he was of opinion that it ought to have been charged against fixed plant account, in this way—that it ought to have come out of the proceeds of the sale, as part of the expenses in connection with it. The next item was a sum of £76 entered for removal of plant from the old to the new works in the account for the year ending May, 1895. The Company had charged this sum to revenue account; and Mr. Robertson had transferred it to the fixed plant account—giving revenue account credit for it. Mr. Millar, however, claimed the sum as being a proper charge against revenue; and in his (witness's) opinion, it was a proper charge against revenue. These three items exhausted Mr. Robertson's £714. There was another item which Mr. Millar claimed, affecting the year 1896, and upon which, he believed, the Company intended to have a claim—a sum of £68 for re-erecting a washer at the new works. They would not find this in the documents before them. It now stood in the capital account; and Mr. Millar claimed that it was a revenue charge. The washer was taken down at the old works, and re-erected at the new ones. It was the same washer, and therefore it ought not to affect the fixed plant account at all; so that they were prepared to allow the amount as a deduction against the profits for the year ending 1896. There was another sum which Mr. Millar had brought forward, in which there was a difference. This was an amount of £50 for Directors' fees for the year ending May 31, 1894. The position was this: Directors' fees were voted at the first annual meeting after the making up of the accounts, and they were voted for the preceding year; so that until the annual meeting was held, the Directors did not know whether they would have anything allotted to them or whether it might be the same sum as in the previous year. In these circumstances, he thought the proper way to deal with the Directors' fees was to charge the amount actually paid during the year as against the year's profits. He therefore thought the Company's accounts, as they stood, were right in regard to this matter. The point only arose for 1894, because the Directors' fees were increased from £50 to £100, and they wanted to go back against that year. In the year ending May 31, 1893, the Company gave Mrs. Mackenzie, on the death of her husband, a gratuity of £100; and this had been charged against the profit and loss net revenue account. It did not affect the accounts for the year 1896; so he had allowed it to stand. It was quite an abnormal charge against the profits for the year. The next item was a sum of £170 for expenses of promoting the new Company, during the year ending May, 1892. This was a capital charge; but it was very much better for the expenses of promoting a company, and so on, to be written off every year, and they had taken it out of profit so that it did not affect the revenue at all. He did not think it should be charged to revenue. They had taken it out of profit and loss net revenue, thereby reducing the divisible amount to which the shareholders were entitled; and he thought they acted wisely in taking it out of their own pockets, instead of charging it to fixed plant account. The statements were applicable to the series of years from 1891 to 1896; and during the years from 1891 to 1894, the manufacture was carried on at the old works. During 1895, it was carried on partly at the old and partly at the new works. He should like a special note to be taken of this matter, because it bore rather importantly on the working for the year 1895. The working for that year could hardly be taken as a criterion, because there were so many disturbing elements. But when they came to the year 1896, the manufacture of gas was carried on exclusively at the new works.

By Mr. JONES: When the works were being removed from one place to another, expenses were caused which probably would not be incurred if they were carrying on the business throughout the whole year in premises which had been occupied continuously for a long time. He should think that disturbing elements would arise with reference to the various payments made, and the charges against revenue, in consequence of the removal. He had not had any experience of such a transition in the case of gas-works; and he had merely looked at it broadly from the point of view of general principles.

Examination continued: One of the tables showed the cost of gas per 1000 cubic feet sold and per ton of coal carbonized, on the average of the six years. Coal during 1896 cost 10s. 7d. per ton, as against 10s. 10d. in 1894 and 12s. 5d. in 1895. Then the residuals produced less during 1896 than during 1895; and the net cost of coal worked out at 12·40d. per 1000 cubic feet in 1894, 12·67d. in 1895, and 8·31d. in 1896. In the years 1891 to 1894, they would find four rather large sums charged for cartage. This was chiefly for cartage of coal, and should have been added on to the cost of coal. Then they would find that in 1895, when they moved to the new works, the cartage account was reduced to next to nothing, in consequence of the coal being sent direct into the works. There was another item which he thought he should perhaps explain—namely, depreciation. These sums—and most certainly the largest of them, £17 17s. 8d.—should really have been charged to the repair and maintenance of works, instead of being put as depreciation. It made no difference to the profit; but it was rather an extraordinary way to enter it. They now came to the working expenses, which were 13·53d. in 1891, and 12·42d. in 1896. The cost of coal and working expenses were 27·88d. in 1891 and 20·74d. in 1896. On the next column, they would find an item of bad debts; and these should have been included before the total working expenses were arrived at. He had prepared a table which showed the price of gas to private consumers, the discounts allowed, and also the price charged for public lighting. It went back to May 31, 1886, when gas was charged at 3s. 9d. The price was reduced by 2d. in 1889, and again by 2d. in 1890. In 1891, it was increased by 2d., and by another 2d. in 1893. Since that time, it had been reduced 2d.; so that the present price was now 3s. 7d. per 1000 cubic feet. The above prices were subject to certain discounts which the Company had arranged. These discounts in 1896 were 1·72d. per 1000 cubic feet; leaving about 3s. 5¾d. as the net price. The public lamps were supplied with gas at the same price as was charged to the citizens, under a discount of 15 per cent. He had also prepared a table showing the dividends paid from 1871 to 1883, and the reserve fund. Referring to the Company's business during the last ten years, there was an increase in 1895 over 1886. When they came down to 1892, they would find that the interest on capital was apparently reduced from 10 to 7 per cent; but this was on the increased capital, and was equal to 10 per cent. on the old capital. The dividends had been paid free of income-tax. The

reserve fund was a simple one, accumulated in three years—£500 in 1894, £400 in 1895, and £400 in 1896. At the present time, the Company's balance-sheet showed the reserve fund to amount to £1300. With regard to the rate of increase of the Company's business, the gas sold in 1886 was 43,612,800 cubic feet, and in 1896 58,520,600 cubic feet—showing an increase in the ten years, of 14,907,800 cubic feet. This worked out at 2·98 per cent. compound; and it practically meant that the Company's business doubled itself in about 23 years. For the year 1891, the revenue, as from Mr. Robertson's reconstructed statement, amounted to £3324. From this he was prepared to deduct £58 for feu-duty, making the corrected profit £3266. For the year 1892, the profit as shown by Mr. Robertson, amounted to £3041; and deducting the feu-duty, the corrected profit was £2983. For the year 1893, the profit, as per Mr. Robertson's statement, was £3111, and the corrected profit was £3052. There was no alteration in the year 1894. In 1895, the profit was £4018. From this he was prepared to deduct the amount for the removal of the plant (£76), making the corrected profit £3941. There was no feu-duty there, as it had all been charged to revenue. For the year 1896, the profit was £5232; and he was prepared to admit Mr. Millar's claim for the erection of a washer (£68), leaving £5164. The amount of capital expended on the works did not affect the value of the undertaking, because, as he understood, this was to be ascertained on the profits. The old works were pulled down, and a portion of them sold; and the proceeds of the sale had been credited to fixed plant account. Standing on the capital account to-day was the full cost of the old works as well as of the new ones, with the exception of the amounts which had been credited for the sale of old material; and probably there might be £11,000 or £12,000 on fixed plant account, which ought, of course, to be written off revenue.

By Mr. JONES: That was after allowing for the £16,000 which was deducted for depreciation.

Mr. JONES: We have before us in the capital statement a sum of £10,000 written up, and another sum of £16,000 written down. Do you say that, after allowing for the £16,000 written down, there would be no depreciation of the worn-out works?

Witness: No; the £16,000 written off for depreciation was written up again to the extent of £12,000. We have written off for depreciation £16,000; but then capital has been written up to the amount of £12,647, which nullifies the depreciation to that extent, leaving only £3400 of depreciation as against the works.

By Mr. FOULIS: That was the depreciation written off during the whole existence of the Company. It would be necessary for this element to be taken into consideration, which the engineers would do in arriving at the maintainable profit.

By Mr. JONES: There was nothing in the contracts of a co-partnery which had, in his judgment, been in any way violated or was at variance with the freedom and liberty of the shareholders to write up or down or to declare 5 or 15 per cent. They had been quite free to charge any price for gas they pleased, and to pay any dividend.

Examination continued: There were certain 4 per cent. mortgage bonds, amounting to £11,900, interest upon which amounted to £481. Those were existing at May, 1896, as burdens on the undertaking.

Cross-examined by Mr. SHAW: He was first consulted regarding this matter about a month ago. He was then aware that Mr. Robertson had been going over the books of the Company for a considerable time, and had prepared the statements to which he had been speaking. He was also aware of the points of difference between Mr. Millar and Mr. Robertson, on the figures and the principles on which the accounts should be made up. With the exception of two very trifling items—the one referring to the charge of a payment to Mrs. Mackenzie, and the other to Directors' fees—he had agreed with the view which Mr. Millar had presented; and he had differed from that upon which the Company's claim was founded. It would have been necessary to reconstruct the accounts, because the accounts of the Company were prepared in a way which did not show the profit on the trading. He had restored the accounts to what they should have been kept at, with the exception of the last item. In the balance-sheet for 1896, the balance in the profit and loss account was £5539. Of this £5012 was paid in dividend, and £526 was carried forward. If the £700 spoken to had not been credited to the profit and loss net revenue account, instead of there being a balance of £526 there would have been a deficiency. Looking to the amount which they had in their reserve fund, and considering they were under no obligation at all, and under no liability in the shape of a standard or maximum dividend, they could pay any dividend they pleased. Witness did not think there was anything wrong in their declaring a dividend of 10 per cent. If he had been called in, and had all the circumstances laid before him at the time, he would have been in a position to have formed an opinion on the point; but what he said was this: Here is a Company without any limitations whatever, and they find themselves with a deficiency in one year of £356. They have a reserve fund of about £1200, to which they can resort, and I do not see that there was anything very extraordinary in the Company taking a portion of their accumulated funds and declaring a 10 per cent. dividend, if they felt inclined.

Mr. SHAW: Are you not aware that in that year they actually increased their dividend from 6 to 10 per cent.? I understand that your view is that they were right to keep up their dividend by encroaching on the reserve fund?

Witness: I do not mean to say they were right. We know that the money was not earned in the year; but having a reserve fund, to which they could have resorted if they pleased, I say there was nothing wrong—nothing criminal—in the Directors declaring a dividend of 10 per cent. when they really had funds in hand to pay it.

I would like to give you the opportunity (if you do not care to accept it, well and good) of saying whether you, as a skilled accountant in gas accounts, would have recommended the keeping up of the dividend to its former state by an encroachment of that description. Would you, in the circumstances that have been laid before you, have recommended that?—I do not think I am in a position to say what I would have done at the time.

Assuming an encroachment to be made on the reserve fund to the extent of £356, would you ever have recommended that to be done for the purpose, not of keeping up the dividend merely, but of increasing it from 6 to 10 per cent?—It looks as if they were anxious to declare as large a dividend as possible; and I think all we can do is to take the fact as it stands—that they did declare a dividend at the rate of 10 per cent., and by the side of that also accept the fact that they were quite justified in doing it, because they had the necessary funds in hand.

Did you approve of their putting nothing to reserve?—They did not ask my opinion.

Do you approve of their having done so in the years 1893, 1894, and 1895?—I think that the creation of a reserve fund is a very good thing, and it is authorized in all statutory companies.

Do you approve of their not putting anything to reserve in the year of this account?—They had such unlimited powers that they could either do it or not do it, as they pleased. I think that the larger the reserve fund a company creates, the better it is.

And therefore, to that extent at all events, you disapprove of no payment being made to reserve in 1896?—They had no surplus to carry to reserve after paying 10 per cent. Of course, if they had been content with 6 per cent., they could have put the difference to the reserve fund; but they elected to divide it in the shape of dividend.

In the profits earned in that year, is there any sufficient warrant for the Company increasing the dividend from 6 to 10 per cent?—I can only give the answer I have given several times before—that here is a company which can do anything it pleases with its profits. Continuing, witness explained that he did not say that the gratuity to Mrs. Mackenzie should have been charged to capital. All he said was that it was quite an abnormal charge; and that in taking it out of profit and loss net revenue, the shareholders were taking it out of their own pockets, and he was not inclined to disturb it. With regard to the question of allowance for repairs and maintenance of works, he had written on that subject in the "Accountants' Journal"* for April, 1889. That was a paper written by him. Dealing with the principle upon which the calculation for renewals was based, he said: "As to renewals and depreciation, the cost of renewals must be charged to the revenue account in one of two ways—viz., either out of the profits of the year in which the ultimate failure of each portion of the buildings and apparatus occurs, or by setting aside each year out of the profits such a sum as will, if allowed to accumulate at compound interest, provide a fund sufficient to meet all renewals as and when they fall due."

Mr. SHAW: Do these accounts show that the books have been kept upon the principles which you lay down?

Witness: I think I may say at once that the amount which we have charged here for repairs and maintenance of works, comes out for 1896 at 2·68d. You will find that the Engineers have made allowance for a sum which, in their judgment, should be charged for repairs and maintenance, in addition to the 2·68d.

Is there any sum set aside for renewals of the gas-works of Dunfermline?—The sum charged in their accounts represents the capital amount they have charged during the year for repairs and renewals. Some amounts have been charged for renewals; no sums have been set aside.

Have the Company debited the renewals as and when they were due?—No; they did not set aside for renewals. If they had renewed as and when renewals had fallen due, I take it the works would not have been in the position in which I understand they were three years ago, when it was necessary to pull them down.

You say: "If 1½ per cent. upon the total amount expended on the works at the end of each year be yearly taken out of the profits, and allowed to accumulate at compound interest at 3 per cent. per annum, it will at all times (assuming the length of life of each portion of the plant, building, and apparatus be taken as above) produce a fund sufficient for the renewal of the works in perpetuity." You agree with that?—Yes. That has not been done in this case.

Assuming that it had been done, what would have been the sum which would have been taken out of the profit and loss account, and placed to the renewal fund. Take the balance-sheet for 1896?—I think I may say that these calculations were based upon a capital of £650 per million cubic feet of gas, equal to a make of over 200 millions, which works out at 2·07d. per 1000 cubic feet. Now, if you apply £650 per million cubic feet to the Dunfermline Gas-Works, it will work out at 2·07d.; but if you take the capital as it exists—which will not be on all-fours with my paper—and apply the 1½ per cent. to it, it works out at 3·43d. per 1000 feet. Reducing the 2·07d. to pounds, shillings, and pence—2·68d. worked out at £655—it would be about £487. If the figure of £1074 given in one of the tables as the capital per million feet in this case were reduced to £650, it would work out at 2·07d.

That is the book value of the capital. The capital of £62,896 never was subscribed by anybody?—You are talking of the fixed plant capital of £62,896, which now stands to the debit of the fixed plant account. I have already stated that I believe it has swelled to the extent of £11,000 to £12,000.

What would be the value of the Dunfermline Gas-Works at £650 per million cubic feet of gas sold?—Well, 58 million feet, at £650 per million, works out at £37,700. I do not know whether that is the ordinary proportion which capital bears to product.

Are you able to say that a figure which would run up to £1074 is extraordinary?—That is purely an engineering question, which I am not prepared to answer.

Do you know that even the renewals of meters in this case have all been charged to capital account?—I have some notion about it. New meters for new consumers should be charged against capital account. All renewals and repairs of meters bear a proper charge against revenue account. Whether a fine line of distinction has been drawn in every case by the Company, I am not in a position to say. There has been charged to the fixed plant account for new meters, during the year ending May 31, 1892, £63; 1893, £124; 1894, £128; 1895, £296; and 1896, £467. There is also a charge of £85 against the fixed plant account for stoves.

Having in view that, since 1893 the number of consumers has gone down from 3988 to 3851, is it not sufficiently clear that these renewals have been of old meters, and have not brought more business to the Company?—If any of the meters which have been charged to capital account were used for renewals, I say these charges ought to have

* See "JOURNAL," Vol. LII., p. 1023.

been made against revenue; and I understood that Mr. Millar and Mr. Robertson had practically thrashed out all these questions. I was prepared to accept the figures as they stood, with reference to the fixed plant account and renewals.

You take it from me that they have all been charged against capital, and not against revenue; and you cannot defend it?—If that is so, it cannot be defended. The £1300 of revenue fund did not represent inflation of the capital; it was taken out of revenue. It might have been divided among the shareholders; but instead, they had transferred it to this fund. It was now one of the liabilities of the Company, and was used in the business as working capital. It was not invested. The gas made in 1896 was 4 million cubic feet less than in 1893; but though less gas was made, they sold almost the same quantity, which had the effect of reducing the unaccounted-for gas. Taking it over the year, the business increased at the rate of 2·88 per cent.

It was 54 million feet in 1891, and is 58 millions now?—In 1894, it went down to 48 millions. As regards that year bad trade and the introduction of the electric light into large manufactories, would account for the decrease. Continuing, witness said that in the next ten years, though there might be fluctuations, he thought the rate of increase would be maintained. It would not be right to take a shorter period than ten years, to see the real growth of the undertaking. In ten years all sorts of peculiar elements arose which affected gas supply. In his experience of gas accounts, he was familiar with the expression "maintainable profit." The profit in the present case for the year ending May 31, 1896, was stated at £5232. In his view, this was not maintainable profit. The Company had in May, 1893, received from shareholders £47,948, and expended £37,128, which left a balance in hand of £10,819. This sum was one of the liabilities of the Company. As at May 31, 1894, the amount expended, as per the Company's accounts, was £52,814; and in the reconstructed accounts, £53,393. To May 31, 1895, the amount expended was stated as £61,272; and in the reconstructed accounts, at £61,986. The difference was made up of feu-duties, the amount for the sale of works (£58), and the cost of removing plant to the new works (£76). To May 31, 1896, the amount expended, as per the Company's books, was £62,302; and in the reconstructed accounts, it was £62,309. The £714 of difference in the previous year's accounts was by this time altered in the Company's books. The fixed plant account was debited with it at Dec. 31, 1895; and it agreed with the amount brought out by Mr. Robertson. In 1891, the capital account was written up to the extent of £6420; but the fixed plant account was only written up to the extent of £2384. The entire writing up of capital then was therefore £17,332. In 1871, the Company were entering upon a new co-partnery, so they proceeded to divide among themselves all the accumulated assets—premiums on share capital, £2677; insurance fund, £1345; increase in value of fixed plant, £2384; and so on. The £2384 was only additional value; the others were funds. In fact, they divided among themselves all their available assets. At this time, the capital account must have been overdrawn, because it was £8420, and the amount expended on works was £17,557. They only required £2384; and so they wrote up the capital £6420, and the fixed plant account £2384. This was how they commenced the articles of co-partnery. The only speculative part was the fixed plant.

Therefore, at that time, they put to capital what should have been preserved for renewals and calls by revenue, or a depreciation fund?—I do not quite follow it in that way. In 1871, a larger amount had been expended on the fixed plant account than the shareholders had subscribed, so the additional amount which had been charged to the fixed plant account had practically been provided for out of the profits of the undertaking, and the shareholders had not divided among themselves so much as they might have done. When they came to close up things in 1871, they had their works valued; and they said: "Now, we have taken out of revenue altogether the sum of £2384, in addition to the £17,557; and we will repay ourselves—that is, we will subscribe indirectly the capital towards the amount which has been expended on the fixed plant account."

In your judgment was there enough put for depreciation in the books of the Company?—I cannot tell you at all; but altogether there was £16,071 written off for depreciation between 1871 and 1896. Before 1871 there was written off for depreciation a sum of £6981. Between 1871 and 1891, it was £9090.

Do you represent that there was enough written off for depreciation?—I do not say anything about it at all. I merely give facts.

I put it to you whether, in your judgment, it was, on a capital of over £14,000, proper to write off only a depreciation of £128?—I cannot form any opinion on the matter at all.

Can you represent it as adequate?—I do not think it is necessary to create a depreciation fund at all. I have said all the morning that we should repair and renew out of revenue.

How could you do that if you were asked to repair the gasholder, for instance?—It is the common practice.

Re-examined: When they were entering into a new co-partnery, they were entitled to the £6000 odd before they commenced. If they had not done this, any new partner coming in would have participated in what had been saved by the earlier co-partnery; and he understood that in Scotland these co-partnerships went on for 21 years, and then came to an end. Mr. Robertson had reconstructed the accounts to show the differences. He called it "reconciliation." On every table, he put a note at the bottom showing the reconciliation of the Company's accounts, and detailing the exact items creating the differences between the accounts and his reconstructed tables; so that in this way each table gave the means of either adopting Mr. Robertson's alteration or taking the Company's accounts without alteration. It was invariably the practice, when a gas company's undertaking had to be valued, and where the accounts were kept as they were here, to have a reconstruction of the kind which had been adopted in this case. They were obliged to reconstruct the accounts; and, as a rule, they did not find gas accounts kept very carefully, especially by small companies. The fact of whether the dividend for the year ending May 31, 1896, was altogether paid out of revenue or profit would not have the slightest effect upon the value of the undertaking. It might be very bad policy on the part of the Directors; but it could not either increase or diminish the value of the undertaking. It did not affect the profits at all. If they wanted to find out what profit a business was making, they did not look to the dividend paid but to the net profit it yielded; and this was founded on the revenue account. The profit and loss account for the twelve months ending May 31, 1896, showed that in the previous year they had carried over a balance of £883, after paying dividend and placing £400 to the reserve account.

The Oversman asked if this £883 was actual cash, or represented by actual cash, or was only a method of accounting?

Witness replied that at all times the balance of the net revenue account, after the dividends had been paid, was one of the liabilities of the Company, which would be found in the general balance-sheet; and they had to find an asset for it somewhere. He further stated that this was the net available balance from the account of May 31, 1895. The net available balance for dividend which the Company had, or the net unappropriated profits, was £4153. Out of this they paid a dividend for the year ending May 31, 1895, which dividend came to £2870; and they transferred £400 to the reserve fund—making £3270, and leaving £883 of net available balance. Then they proceeded to add the profits for the year ending May 31, 1896, and the interest on deposits, and so on. Out of these profits they paid income-tax, discounts, bills, and the interest on the mortgage bonds. On May 31, 1896, they had £5539, which was available for the year ending then; and out of this sum they paid dividend to the extent of £5013—leaving a net available balance of £526.

By Mr. Jones: That is backed up by the reserve fund of £1300; and, as I have already said, with reference to the £714 which has been credited in these accounts to the profit and loss (net revenue) account, if that £714 had not been credited, instead of there being a balance of £526 in favour of the Company, there would have been a deficiency of about £200.

Re-examination resumed: Repairs and maintenance worked out at 2·68d. per 1000 cubic feet; and, in his opinion, this was not sufficient for repairs and renewals. It was the only point he had in his mind when he gave the general answer that he thought £5232 was not a maintainable profit. He made out the net profit for 1896 to be £5164. Some companies charged all new meters to capital; and it was just possible that here they might have had a considerable number of new meters in stock in 1896, which they intended to use at some future time. He could not say whether or not this included a large number of penny-in-the-slot meters; but possibly it would. If so, this would not affect the revenue at all.

By Mr. Jones: The figure he took in his paper which had been referred to was just a round ideal figure; and he did not suggest that, under all circumstances, and at all times in the history of a company, it would be correct.

Mr. Jones: With regard to the dividend in 1896, you said the Company actually earned £5164, and they required £5012 to pay the 10 per cent., and £481 to pay debenture interest—together £5493; and then there was a small sum of £40 for interest on deposits, which brings it up to about £5530. If the earnings were £5164, that would mean that there was a deficiency of something like £380, for which they would have to go to the accumulated balance.

Witness: Yes. Eliminating altogether the £714 in the previous balance, and taking it on the year alone, the earnings of that year paid the debenture interest and the dividend within about £340; and as they had a reserve fund of £1300, I think they were justified in doing what they did. It does look like a large jump; but the Company are not under any parliamentary obligations at all.

The question is whether it was prudent, having regard to everything, What is your opinion as to that?—That is a question of policy, which the Directors settled in the board-room; and I do not think it was very extraordinary. It was a general custom among gas companies to have a depreciation fund. The average life of plant was from 37 to 40 years. This was how he worked out his calculation. With regard to the repairs charged here, it was a question of degree, and not of principle, whether sufficient had been charged. If renewals had taken place in the year 1896, and the Company had been carrying on business in the customary manner, they should have found the renewals charged in the repair and maintenance account in the usual way. But there was not much of that sort going on; so that they had a low figure—2·83d.—which was not sufficient when they came to ascertain the maintainable profit.

By Mr. Foulis: If, as you say, there was £13,000 not in any way represented in the works, do you not think it should have been provided in some way or another?

Witness: That will be provided for in this account—in the difference between 2 83d. already charged to, and the sum which the engineers intend allowing for the repairs, to cover the average amount which should have been charged for renewals.

Mr. T. *Newbigging*, M Inst.C.E., said he was very well acquainted with Dunfermline and the district. In conjunction with his son, he designed the present new gas-works, and superintended their erection. They were completed and put in operation in August, 1894. The old works were abandoned on the completion of the new. The former works were situated in the town. The site was inconvenient, seeing that it was in the midst of a very considerable population; and besides that it was too limited. It was hemmed in on every side; and there was no space for further extension. The works had, in fact, become too small for the Company's business. The site of the new works had an area close upon three statute acres; and the feu-duty payable to Lord Elgin was £74 7s. per annum, or £25 per acre. He thought the site of the new works was the best possible one that could be obtained. It abutted on the railway; and they had the opportunity of bringing coal by rail right into the store, and they could also take their residuals away by rail, if necessary. Another advantage was that the works were at the lowest part of the district. They were outside the town; and there was no population in the neighbourhood of them. The works had been designed and set out so as to admit of enlargement easily, and at the least possible expense. Even as now existing, they could furnish a supply of gas in excess of present consumption without further expenditure. Gas-works should be capable, if demand arose, to give an increased supply; they should have a margin. These works had gone beyond the usual, so as to meet prospective increase. They contained, for works of their size, all the best appliances and the best

plant and machinery for producing gas economically, and also of a high standard of purity. The railway siding was 650 feet long, and contained a double line of rails. The coal-store was coterminous with the retort-house, which was an advantage. There was covered storage space for 2700 tons of coal. At present, the retort-house contained 64 retorts, which were fired on the regenerative system. They were capable of producing half a million cubic feet of gas per day, besides allowing a very ample margin of about 15 or 20 per cent. At present only half of the house was occupied with retorts; and the number could be duplicated without any enlargment of the building. The retort-bench was so placed that it could be extended in a straight line. If this were done, the capacity of production would be a million cubic feet of gas per day. The internal dimensions of the retort-house were such as to admit of the application of stoking machinery whenever this was considered advantageous or desirable; and the house was designed with this object in view. They had, of course, a condenser and exhauster, tar extractor, tower scrubber, washer-scrubbers, station meter, and governor; and these were all of the capacity for dealing with half a million cubic feet of gas per day. The buildings containing the exhauster, boiler, pumps, station meter, and governor were of a size capable of containing apparatus and machinery sufficient for all the gas that could be produced. In the event of their doubling the retorts, they would have to extend their condenser, exhauster, tar extractor, and so on. The purifiers were very ample in size, each being 22 feet square. The purifier-house was not of sufficient size to permit of the purifiers being duplicated; but the house could be doubled in size at any time. The purifiers were, however, large enough to purify twice the present production of gas. There were four purifiers; lime being the material employed. The capacity of the underground tar and liquor well was 50,000 gallons. The other buildings consisted of lime-shed, stores, fitters' shop, foreman's house, and office; and the office contained the general office, the Manager's room, the coal-testing room, the photometer-room, the laboratory, and other conveniences. There were two weighbridges—one designed to weigh 20 tons, which was fixed on the railway siding; and the other to weigh 3 tons, which was at the entrance to the works. The total length of the mains in the streets was 18 miles; and their size ranged from 18 inches down to 1½ inches. There were 4339 service-pipes. The number of consumers' meters, both wet and dry, was 3939; and, in addition, there were meters belonging to consumers to the number of 400. Taken generally, the distributing plant, both main and service pipes, was in very good condition indeed. It was ample in size, with the exception of some of the smaller mains. He did not advise such small mains as these being laid; but they were there, and he thought they ought to be enlarged. Taking them as they found them, they were in very excellent order. They had had them opened up in numerous places, and carefully examined; and the metal in them was almost as good as on the day they were put down. The initial pressure and the amount of unaccounted-for gas enabled them to test the efficiency of the pipes. The mains, both small and large, stood the test very well indeed. The unaccounted-for gas was only 8½ per cent. though it was a very irregular district to supply; and that, he considered, was a good criterion of the condition of the mains and services. The average in the various gas-works throughout Scotland was 10·09 per cent.

By Mr. JONES: He was bearing in mind that it was 17½ per cent. in 1894; but he was taking it at what it was now. They had carefully gone over all the mains, and improved them.

Saturday, Oct. 10.

On the resumption of the proceedings this morning,

Mr. *Newbigging* was further examined by Mr. ASHER. He said he could give the comparison, as regarded unaccounted-for gas, between Dunfermline and the various gas-works in Scotland per mile of mains. This comparison was even more favourable to Dunfermline than the one he had made. In Dunfermline and district, the loss per annum per mile of main was 310,978 cubic feet. But the loss in the various gas-works in Scotland included in the Parliamentary Returns was 556,040 cubic feet per mile of main, or 78·8 per cent. more than in Dunfermline. Thus—

	Cubic Feet.
Gas made—	
Local authorities	7,992,736,312
Companies	105,044,100
Total	8,097,780,412
Gas sold—	
Local authorities	7,059,579,763
Companies	88,573,480
Total	7,148,153,243
Gas consumed in works (1·64 per cent. of the make)	132,803,598
Total gas accounted for	7,280,956,841
Total gas unaccounted for (10·09 per cent. of the make)	816,823,571

This worked out, for 1469 miles of mains, to 556,040 cubic feet per mile. He knew what percentage of gas was consumed in the works at Dunfermline; and he had taken the same percentage for the other works in Scotland, for the purpose of comparison.

By Mr. JONES: There were very few statutory Gas Companies in Scotland.

Examination continued: They recently had the mains laid bare in twelve different places, and found the metal in perfect condition at every point they examined.

Mr. FOULIS: Did you examine the services as well?

Witness: If the services were laid bare, we examined them; but necessarily they would not be in the same good condition, because they were of wrought iron. We would not examine the services to see if they were in good condition, because we should know that if they were a certain number of years old, they could hardly be so.

In further examination, witness said they purposely selected what they knew to be the oldest mains. Some had necessarily been put down at a much later date than the original starting of the Company, owing to extensions; and therefore, when he spoke of the mains being laid from the date of the starting of the Company, he meant the oldest of them. He could not speak to the proportion of the existing mains (if any) which had been renewed since the Company was started; but he knew that there had been extensions from time to time which necessitated the laying of mains. At the places which were opened, they scraped off the rust with their knives, and found the metal in the mains to be quite sound and good. The quantity of gas produced for the year ending May 31, 1896, was 65,187,000 cubic feet; the quantity sold was 58,520,600 cubic feet. There had been a growth in the consumption during the six years from 1890 to 1896 of 7,382,600 cubic feet, or 14·43 per cent. This, of course, included the year 1894, which was quite an exceptional one in Dunfermline, as there was very great depression in the local trade, which necessarily largely affected the consumption of gas. There was an increase in the consumption last year over the preceding twelve months of 7½ per cent. As far as he could judge from the information at his disposal, this rate of increase was likely to be maintained; and he should expect it to be exceeded in the future. He was aware that the prepayment meter system had recently been introduced into Dunfermline; and it was being rapidly extended. He thought that Dunfermline was a very promising field for this mode of supply. They could not have introduced and pushed the system in the old works, because they had a difficulty in supplying the demand for gas which existed; the works being too small. But now that they had ample productive power, they were able to push the system; and if they had time to develop the new works and make the best of them he believed that in a few years there would be an enormous increase i the consumption by the use of the prepayment meter. So far as he could judge, the trade of the town was improving; and he saw considerable building going on. He thought the prospects of the Company were very favourable; and he looked upon it as a misfortune for them that they had to dispose of their works. In his opinion, there was ample scope for the growth of gas consumption in the daytime, in connection with cooking and heating purposes and motive power. He thought that any effort to push the gas business in this direction would be remunerative, because it would not need an expenditure of much capital to do it, and the consumption would be chiefly in the daytime. The price charged for gas in Dunfermline at present was 3s. 7d. per 1000 cubic feet; and this compared favourably with the price in other places. He had prepared a list of the larger towns in Scotland, showing the population and the make of gas, and the price in each; and he produced the list. He had taken the price charged in Dunfermline at 3s. 7d., for the purpose of comparing it with the charges in other towns. Whatever discounts were allowed, had to come off the price. He rather thought that 3s. 7d. was the price realized.

Mr. JONES: The net rental set out clearly in one of the tables is 41d. per 1000 cubic feet.

Witness (continuing) said he supposed he had the means of ascertaining what were the discounts allowed in other towns; but he had not looked into that matter. For the purpose of comparison, he had taken the price in Dunfermline irrespective of discount; and he had taken the price charged in other towns in the same way. He therefore took 3s. 7d. merely for purposes of comparison.

The OVERSMAN: You have not gone generally over the list, but have selected particularly the largest towns, where gas can be supplied more cheaply than in others?

Witness: That is so. The price in the smaller towns is very much higher than it is here; but I have selected the larger towns.

Mr. JONES: Your selection has been impartial in the sense of picking out the least favourable?

Witness: Yes.

Mr. FOULIS: I think you have taken a very representative lot of towns.

Mr. SHAW: I do not think they are very representative—for instance, Peterhead.

Witness explained that there was a population of 13,000 in Peterhead. The instances he had given were from the latest returns issued by the North British Association of Gas Managers. They were published in 1895; and probably they related to 1894.

The OVERSMAN: It comes to this, that these figures are two years old?

Witness: They are the latest I could get.

But the table is open to the remark that you are comparing the present price of gas in Dunfermline with the prices at those places two years ago?—Or perhaps eighteen months ago.

And some of them have been reduced. For example, the price at Glasgow has been reduced to 2s. 2d. per 1000 feet?—Yes; there may be some change. It is open to that remark. There has been no change of price in Dunfermline since the date of the returns.

Mr. FOULIS: But Dunfermline remains the same, while others have been reduced.

Mr. JONES: In Glasgow the price is net; but in Dunfermline it is subject to a discount of 2d. upon the realized figures Mr. Lass gave us yesterday; so there is a little correction in favour of Dunfermline?

Witness: Yes. I averaged them roughly; and I found that Dunfermline was slightly below the average.

Examination continued: These returns were issued at Aug. 1, 1895; and he thought the prices there disclosed would be those for the then current year. The capital of the Dunfermline Company was £62,896, which worked out to £1074 per million cubic feet of gas sold. He found, on looking through the Parliamentary Returns, that the relation of capital to output was by no means exceptional. He had picked out the names of some companies, taken at random, which showed a larger proportion of capital. In Scotland, there were 49 companies whose capital ranged from £900 upwards per million cubic feet of gas sold; and he had taken at random from the statutory returns relating to England a number of companies whose capital expenditure ranged from £900 to £1100, and even to £1500, per million. They were as follows: Radcliffe (Lancs.), £1513; Bishop Auckland, £1275; Chesterfield, £1476; Haslingden, £1019. These were large companies; he believed all of them larger than Dunfermline. He supposed the population of Radcliffe might be 30,000 or 40,000. There were also: Glossop, £938; Peterborough, £972; Epsom, £1149; Worthing, £1078; Clayton, £1129; Drighlington, £1019; Lea Bridge, £1057; West Kent, £1129; Bromley, £925; and then Falkirk, before the transfer, £1146. At Dunfermline, the works were considerably in

excess of present requirements, which would, of course, require to be kept in view when the relation of the capital to the present gas sale was considered. An expenditure of £20,000 would enable the Company to make and supply 150 per cent. more gas than they were now actually doing. Their present power was 500,000 cubic feet per day, with a margin of 15 per cent. in addition; and the maximum day's make was about 380,000 cubic feet. If £20,000 were expended, the power of the works would be 146 million cubic feet per annum.

Mr. JONES: That is to say, your works are now equal, if they strained every effort, to 675,000 cubic feet a day, or 15 per cent. above what you are doing.

Mr. FOULIS: The capacity of works is usually calculated, not upon the quantity made, but upon the maximum producing power per day; and this differs somewhat in Scotland from England, because our winter days are very much shorter than in England, and it is important to know what the daily make would be.

Witness: Roughly, I can tell you that. The daily make, with 150 per cent. more sale, would be about 950,000 cubic feet. This would be the maximum. The present daily maximum is 380,000 cubic feet.

Mr. FOULIS: You are actually making 380,000 cubic feet, but your capacity is 500,000; and adding 150 per cent., would raise you considerably over a million.

Examination continued: When he said that the present daily maximum was 380,000 cubic feet, he had better qualify that a little. The actual maximum had been about 400,000 feet; but there was no necessity that it should be so much. The stock of gas had been allowed to run too low before they worked additional retorts. If they had put on the retorts in time, 380,000 cubic feet would have sufficed as the maximum; and he had taken it at that. He knew that was the proper maximum for the works as they stood. If the works were so extended, the capital would stand at £83,000. The annual sale being 146 million cubic feet, the capital would represent £575 per million feet sold.

Mr. JONES: That is carrying it on till the trade develops the capacity of the works?

Witness: Yes; and I think that is the proper way to look at it, because these works are in excess—the site and everything else is in excess. Witness went on to say that the site and the works had all been made with a view to extension. Taking all the circumstances into account, the capital appeared to him to be reasonable in amount. He had considered what the commercial value of the Company's undertaking was. It was a non-statutory undertaking. There were advantages connected with that, as well as disadvantages. He thought that non-statutory companies had a very substantial protection, particularly in Scotland, where the Burghs Gas Supply Act was in force. It effectually prevented competition on the part of the local authority. He did not think there would be any chance of Parliament granting competitive powers, except on the footing of purchasing the undertaking. It appeared to him that there was very little difference now-a-days, between statutory and non-statutory concerns.

By the OVERSMAN: He was speaking generally, but particularly of Scotland, on account of this Act. Generally, in his opinion, there was very little difference in the security of a statutory and a non-statutory company.

Examination continued: Of course, a non-statutory company had freedom of action which a statutory company had not; and really there was no danger of competition against a non-statutory company. He looked upon the Dunfermline gas undertaking as a valuable and safe investment for shareholders. He thought that the property, when sold, should yield to the proprietors a profit equal both in amount and security to that which they were now earning. He would rather have Dunfermline gas shares than Metropolitan gas shares as an investment. He considered they were quite as safe, if not safer. Ordinary Metropolitan Gas Company's shares could not be bought to yield more than 3⅜ per cent., which was 26⅔ years' purchase. Having this in view, in his opinion the value of the Dunfermline gas undertaking was 26⅔ years' purchase of the maintainable profits. Having ascertained the number of years' purchase, the next point to be determined was the maintainable profit of the concern; and for this purpose he had been supplied with the Accountants' statements. In order to arrive at the maintainable profit, some adjustment was necessary, in his opinion, of the revenue account. He took the figures in the accounts for the year ending May 31, 1896. The balance of profit was £5232. The charge for repairs and renewals of works, plant, and mains in the account was 2·68d., and for the repair and renewal of meters 0·11d. per 1000 cubic feet of gas sold. This was the actual expenditure for the year for the purposes named. The works being new, the actual expenditure would be less than if they had been old. In valuing works on the principle of maintainable profit, it was necessary to take the rate for repair and maintenance which would keep up the works and reproduce the actual value at the end of their life. For the purposes of his valuation, he increased the expenditure for repairs and renewals of the works, plant, and mains by 1·74d. per 1000 cubic feet sold, which was equal to £424. He also increased the repairs and renewals of meters by 0·45d. per 1000 cubic feet sold, making 0·56d. for repairs of meters, or £109. This, added to the £424, made a total of £534, which was the deduction he made from the profit as shown in the accounts. In his opinion, this annual deduction from the profit would be sufficient to repair the whole works, plant, and mains, and to reproduce their value at the end of their life. He had also deducted from the figures in the accounts a small sum of £3 for transfer fees; and also interest on mortgages amounting to £481. These three deductions, added together, came to £1018; and taking this from the £5232, he brought out a net maintainable profit of £4214. He understood that Mr. Lass dealt with a sum of £68 for re-erecting a washer, which led him to reduce the profit from £5232 to £5164. In the method which he (Mr. Newbigging) had adopted, it was not necessary for him to deal with this sum, because he had made a sufficient allowance for repairs and renewals. He dealt with it, not upon the actual expenditure of the year, but upon what, in his experience, he thought the necessary annual sum; and Mr. Lass's correction dealt with the matter upon the actual expenditure for the year. He had allowed a sum far in excess of £68 a year. In his opinion, £4214 was the maintainable profit of the undertaking, on which the valuation should proceed. For the reasons he had already given, he should multiply this by 26⅔ years' purchase; giving a sum of £112,373. He also allowed 10 per cent. for compulsory sale (£11,237), and for surplus works—by which he meant works in excess of what were required for the present production—£7400. If a valuation were made upon the present profit merely, that would not include any allowance for works upon the ground not at present producing profit. For example, the purifiers were 100 per cent. larger than was necessary for the present make. The capability of large extension on a small expenditure, which he referred to with regard to the £20,000, was an important element of value; and accordingly he considered what should be allowed, and fixed it at £7400. Then he would allow £1000 for winding-up expenses. That made £132,010 in all. He did not know exactly what the £1000 would cover; but he should say partly the cost of the present proceedings, the cost of distributing the money among the shareholders, and legal charges—expenses attendant upon winding up the Company generally. He did not think the Company could be converted into money without incurring considerable outlay of that sort—engineering and legal advice, and so on. He looked upon the 10 per cent. for compulsory sale as repaying the shareholders for the investment of their money. His valuation had proceeded upon the supposition that the mortgages were taken over by the Corporation as an existing burden on the works; and he had deducted the interest on the mortgages from the profits for this reason. In addition to his valuation, there would necessarily be stock-in-trade falling to be taken over by the Corporation.

Cross-examined by Mr. SHAW: There was only one boiler for the engine and one exhauster in the works. It was common, in works of this sort, to duplicate both the boiler and the exhauster; and in the present case there was room for this being done. The works would not be brought to a standstill by a breakdown of the exhauster or anything going wrong with the boiler. It would not make much difference, though the exhauster could not be used for a short time. The boiler and exhauster were both quite new. The object in duplicating such things was not specially to prevent the confusion that would ensue if they went out of order, but to secure the highest advantages possible. In his view, it was unnecessary to duplicate these parts of the Dunfermline works for (say) seven or ten years. He supposed there were two or three hundred works of similar size in which these things were not duplicated; and some works double the size had only one boiler. He would recommend here that there should be two boilers and two exhausters when the consumption increased. He had included all this in the £20,000 which he said would be necessary to produce 150 per cent. more gas. Roughly speaking, it would cost about £300 to duplicate the boiler and exhauster. He should not recommend that stoking machinery should be put in until they built another retort-house. This was, however, looking a long way ahead. Each setting consisted of eight retorts. The product of one charge of a setting of eight retorts was 66,400 cubic feet, or 8300 feet per mouthpiece. There were altogether 64 mouthpieces, which gave a production for the whole bench of 531,200 cubic feet. He did not remember what was the minimum consumption of gas in the summer; but he should say it was not less than 66,000 feet per day.

Mr. FOULIS: Is it not double that? Can you have one side of the retort-bench satisfactorily working without the other?

Witness: Yes; there is no trouble about that. We have fires on both sides; they were purposely arranged in that way.

Cross-examination continued: He did not think the minimum consumption per day was less than they could produce by one setting. If it were, it was not necessarily the only way for regulating the production to undercharge the retorts—it could be done by leaving one or two retorts uncharged. This would not be very bad for the retorts; but it all depended on how the thing was managed. He would not work a bench on the principle of leaving some of the retorts uncharged if he could help it. This could be avoided if the settings, instead of having eight retorts, contained less; but there would be loss at the other end. This did not point to the advantage of having settings not so large, for a place like Dunfermline, because he knew the consumption would rapidly increase now that the Company were able to push it. He did not think it would have been good policy to have had less than eight retorts in a setting. He did not approve of mains of smaller dimensions than 3 inches. If he were building works he would put in 4-inch ones. One of the disadvantages of having the mains less than 3 inches was that, in order to maintain the supply in all parts, they required to use greater pressure than would otherwise be necessary; and the greater the pressure, the greater the risk of leakage. There were a considerable number of mains in Dunfermline less than 3 inches; and these should be gradually renewed with larger ones. This would involve a good deal of expenditure. Beyond that, however, he looked at the actual facts; and he found that there was a leakage of only 8½ per cent. Therefore he was quite satisfied to allow the mains to remain. He thought the total number of yards of mains under 3 inches was about 9000. There were 3011 yards of 2-inch mains, 5931 yards of 1½-inch, and 731 yards of 1-inch—making altogether 9673 yards. At 2s. a yard for renewal with 3 or 4 inch mains, the cost would be £967. He was crediting something for the value of the old pipes which would be lifted. Assuming that the old material would not fetch anything, the cost of laying new and larger mains would be 3s. 6d. a yard. He had no idea of disturbing the mains at present, because he was satisfied with a leakage of 8½ per cent. The cost of larger pipes, at 3s. 6d. per yard, would be £1300. He did not think that a great many of the mains were too near the surface. In his opinion 1 ft. 9 in. in depth was quite sufficient. He believed that a good many of the mains in Dunfermline were laid at a less depth than 1 ft. 6 in.; but that was the case in every town. Such mains should be lifted and put further down; but so long as there was only 8½ per cent. of leakage, he would not disturb them. He had looked at the meters. It was not the case that a great many of them were old and out of date. They were not older than those of other companies. There were always old and new meters; and as the old ones wore out, they were replaced. There were about 3000 wet and 800 dry meters. All which had been put in since the passing of the Sales of Gas Act would be stamped. The number of consumers was apparently decreasing; but the fact of the matter was that there had been a lot of people kept on the books who were really not consumers at all, and

they had been all wiped out. In his calculation of the maintainable profit, he took the price of gas at 3s. 7d. as absolutely maintainable at the present consumption; but he had no doubt that, as the consumption grew, and the works were developed, they would be able to reduce the price and still maintain the profit. The cost of the new works at Dunfermline was about £25,000. He saw from documents he had with him that the amount of the contracts was £22,390. In addition to this they would have to compute the value of the land; and the value of the plant which was in existence was £7974. There was also the purifying apparatus, a lime-shed, a gas tank and holder, and other stocks on the works, a station meter and meter-house, the levelling and paving of the yard, workmen's conveniences, and the foreman's dwelling-house and garden, all of which were in existence before. He would estimate the value of the distributing plant at £16,603. He supposed that all the elements he had mentioned would not bring up the total value to more than £50,000, apart from the land. He was aware that the book value of the works, plant, and machinery was £62,000 odd. The discrepancy was capital lost. It would probably have been made good out of revenue, if they had been allowed to go on working. The discrepancy arose over the transference of the works in 1894. They had not had time to make provision for this by the formation of a reserve fund—last year was their first year's working. If it was the case in Scotland that a corporation or burgh could cut and lift every main which a non-statutory company had laid in the streets, that would not, in his mind, make the slightest difference between the position of a statutory and non-statutory company. He would not be the least afraid of anything of the kind, because, in his opinion, it was simply a bogey. Gas-works were, as a rule, sold far too low in price; and a non-statutory company, he believed, was worth more than 26¾ years' purchase. There was nothing safer or steadier than gas investments; they were far superior to ordinary railway shares. He gave 23½ years' purchase as sufficient in the Falkirk case. His valuation there was £105,000; while the award was only £77,000. If they took the other view of it, the award was 31 years' purchase of the valuation put upon the undertaking by the other side.

By the Oversman: In that case the figure of maintainable profit was widely different on the two sides. The leakage was 20 per cent., too; and a great expenditure had to be incurred to put the works into a state of efficiency, which they had not here.

Cross-examination continued: If the Metropolitan Companies were sold, they would fetch 30 years' purchase at the very least. The gas-holder capacity at Dunfermline was 575,000 cubic feet. This was 1¼ days' supply, and was not at all an excessive margin.

Mr. Shaw: I wonder if you would agree with what I am about to quote: "It is a recognized rule that the working storage capacity of the gasholders should be equal to about 1¼ days' maximum producing power?"

Witness: Yes, all round it is. In Lancashire, I should say that would be right, because there is an immense number of large mills which come suddenly on at night; and you therefore need more there. But I would not say that with regard to Dunfermline.

Would you be surprised to hear that the passage I read is from a report by yourself to the Chairman and Directors of the Dunfermline Gaslight Company, and that the statement has reference to these gas-holders?—Well, I will explain. I was, of course, called in at the time with all my Lancashire ideas; but now, from my later experience, I should say that a day is quite sufficient.

In further cross-examination, witness said that supposing the capital value were taken down to about £50,000, this would mean about £800 odd per million feet of gas. Even this was very high as compared with a great many gas companies in Scotland; but there were 49 companies whose capital was in excess of them. They were both little and big companies. In Ayr, the proportion was only £620; in Coatbridge, £617; in Galashiels, £375; and in Hawick, £343. But in these places the works had been extended out of profits—the consumers had been paying for the works instead of the shareholders.

By Mr. Jones: Structural valuations never balanced the expended capital. He found that to be universal. He did not think that mains could have been laid thirty or forty years ago so cheaply as the present structural value of them. They were much more expensive before the introduction of the hot blast. They were laid very much better, and were likely to last longer than the more modern and cheaper pipes. It was his experience that some of the old pipes were the best.

Mr. Foulis: I would like to refer you to the small amount that has been charged for the repair and maintenance of meters for the last five or six years; the whole sum amounting to £322 for 4000 meters. This seems so utterly inadequate, that I naturally suspect that the meters must be in a very bad condition.

Witness: I do not think so; but I can tell you it will cost about £122 a year to keep the meters in order. They are not much neglected.

(To be continued.)

Sales of Shares and Stock.—Seven original £25 shares in the Winchester Water and Gas Company were last week disposed of at £63 5s. each; this being the highest price these shares have ever fetched. At Bath, last Tuesday, £50 of 8 per cent. stock of the Bath Gas Company realized £102 10s.; £50 of 7 per cent. stock, £90 10s.; ten £10 shares (7 per cent.) went at £181; and ten others (5 per cent.), at £128 10s. At Littlehampton, last Wednesday, £150 new £5 shares in the Littlehampton Gas Company were sold at an average price of £7 19s each. The total amount realized by the sale was £1186 6s.

Extensive Improvements in the Hull Water-Works.—Some important improvements and extensions are contemplated in connection with the water-works of the Hull Corporation. In the first place, it is proposed to duplicate the entire main from the Mill Dam springs to Stoneferry with a 30-inch pipe; and, in conjunction with this, it is intended to make other additions to the distribution system in order especially to improve the supply to manufacturers. A public competition is to be invited for plans for new engines capable of pumping 10 million gallons of water daily for the old engine-house at Springhead; and the Water Committee have also in view the construction of a storage reservoir at Willerby.

METROPOLIS GAS SUPPLY.

Dr. A. W. Williamson's Quarterly Report.

The following is the report of Dr. A. W. Williamson, F.R.S., the Chief Gas Examiner for the Metropolis, on the quality of the gas supplied during the quarter ending the 30th ult:—

The average illuminating power and the average amount of sulphur present in the gas at each of the testing-stations are set forth in the accompanying table.

	Illuminating Power.	Sulphur.
The Gaslight and Coke Company—		
106, Fenchurch Street, E.C.	16·4	12·5
10, Kinghorn Street, Cloth Fair	16·4	10·5
1, Dorset Buildings, Salisbury Square	16·6	10·0
21, Millbank Street, S.W.	16·5	7·9
123, Ladbroke Grove, W.	16·4	8·6
3, Vincent Terrace, Islington	16·4	12·1
1, Carlyle Square, Chelsea	16·2	10·7
170, Camden Street, N.W.	16·2	11·0
14A, Graham Road, Dalston	16·7	11·6
47, Kingsland Road, E.	16·8	8·3
Spring Gardens, Charing Cross	16·5	10·3
1, Vinery Villas, St. John's Wood	16·2	11·4
116, Lambeth Road, S.E.	16·2	10·8
121, Hornsey Road, N.	16·4	11·0
66, George Street, Hampstead Road	16·7	11·7
Commercial Company—		
6, Wellclose Square, E.	16·2	7·9
24, Parnell Road, E.	16·2	7·3
South Metropolitan Company—		
104, Hill Street, Peckham	16·6	7·4
37, Bedford Road, Clapham	16·2	8·4
1, Stoney Lane, Tooley Street	16·8	10·5
180, Lewisham Road, S.E.	16·4	11·1
99, Blackfriars Road, S.E.	16·7	10·4
211, Burrage Road, S.E.	16·3	9·5

It will be seen from these results that the average illuminating power of the gas at all the testing-stations has been higher than the parliamentary standard. The average amount of sulphur present has been considerably less than the quantity permitted; in some cases amounting to less than half the quantity allowed—viz., 17 grains per 100 cubic feet of gas. Ammonia has been generally present in the gas more or less frequently during the quarter at all the testing-stations, but only in slight quantities. The amount allowed—viz., 4 grains—was not exceeded on any occasion. Sulphuretted hydrogen has not been present in the gas at any of the stations.

GAS WORKERS' WAGES AND HOURS AT LEEDS.

The Gas Committee's Decision.

At a Meeting of the Leeds Corporation Gas Committee last Thursday, the application from the Gas Workers' Union for an advance of wages for the men employed in the various gas-works of the city was discussed. After a lengthy debate, the following resolution of a Special Sub-Committee, appointed to consider the question, was confirmed: "The Sub-Committee beg to report to the Gas Committee that they have had an interview with the representatives of the gas-workers upon the subject of the application for an increase of wages, but consider that no new argument in support thereof was adduced. The Sub-Committee are of opinion that the wages paid are equal to those paid in any other Corporation works, and in excess of some; and that the conditions of labour in the Leeds Gas-Works are in every respect as favourable to the men as elsewhere. The Sub-Committee, however, recommend that the yardmen be placed upon an eight-hours' day." In short, the Committee decided not to grant any advance of wages, but resolved to reduce the hours of the yardmen from nine to eight hours a day. This will now make a uniform system of eight hours a day for the workers employed in every department of the works.

THE PRICE OF GAS IN MANCHESTER OUT-DISTRICTS.

Memorial to the Board of Trade.

A memorial has been addressed to the Board of Trade by the Withington District Council complaining of the excessive charge made by the Corporation of Manchester for gas consumed outside the city boundary. The memorialists say they are practically compelled to be consumers of gas supplied by the Corporation on account of the latter having secured what has become a valuable monopoly. In the city the price is 2s. 3d. per 1000 cubic feet; in the Withington district 2s. 9d., *plus* meter-rent. In February, 1895, the Gas Committee reported to the City Council in favour of supplying city consumers for other than lighting purposes at 2s. per 1000 cubic feet; that for many years the city rates "have been relieved by profits made upon gas in some cases to the extent of upwards of £80,000 per annum," and that the consumers in the Withington district have "for years indirectly contributed largely towards the relief of the city rates." For thirty to forty years, the Corporation have charged a uniform differential rate of 6d. per 1000 cubic feet for gas supplied to consumers beyond the limits of the city; and when gas in the city was about double the present price, the same differential rate prevailed. The memorialists have applied without avail to the Corporation to reduce the existing charges, and have been informed by the Corporation that when they last lowered the price by 3d., this was equivalent to a saving of £2000 a year in Withington. The only logical inference the memorialists can arrive at from the published report of the Gas Committee of February last, in conjunction with the foregoing statement of the Corporation as to the saving of £2000 a year, is that (*a*) assuming that the Corporation were not proposing to supply gas below cost price at 2s. per 1000 cubic feet, then the gas supplied

to Withington presumably costs the Corporation about £16,000 a year; (*b*) taking the present price at which gas is charged in Withington at 2s. 9d., then the Corporation received from Withington consumers £22,000 a year; and, further, that inclusive of meter-rents the Corporation are making, according to their own showing, upwards of £6000 per annum profit in the memorialists' district. Attention is called to the fact that, after the application of the memorialists for a reduction in the price of gas, the Gas Committee recommended the City Council to reduce the price in the out-townships (including Withington) by 3d., as well as to abolish the charge made for the hire of meters, which, it was stated, would be equivalent to a reduction of £8000 per annum. The City Council, however, rejected the recommendation. In view of these facts, the Board of Trade is asked to introduce a Bill in Parliament to limit the amount of profit which municipal corporations shall be empowered to make in cases where they supply gas to consumers outside the municipal boundaries.

WIDNES CORPORATION GAS AND WATER SUPPLY.

The Disposal of the Profits.

At the Meeting of the Widnes Town Council last Tuesday—the MAYOR (Alderman Sadler, J.P.) in the chair—a report was presented by the Finance Committee which contained an important recommendation in regard to the funds of the gas and water undertakings of the Corporation. A Sub-Committee was appointed on the 8th of July last for the purpose of considering the provisions of the Local Acts with regard to the gas and water funds, and reporting to the Committee as to whether any and what amendments or alterations were desirable therein. The report stated as follows:—

Your Sub-Committee have considered the provisions of the Widnes Improvement Act, 1867, with regard to the application of the gas and water works funds established under such Act of Parliament. The effect of the provisions in question is that the surplus income from the gas-works and water-works undertakings must, notwithstanding the provision of the sinking funds, which by law the Corporation have to maintain, be applied in reduction of the capital debt of the undertakings; and the period of entire redemption of such debts is thus considerably accelerated. The periods which, by virture of the Widnes Improvement Act, 1867, the Widnes Local Board Act, 1875, and the Provisional Order of the Local Government Board, dated May 24, 1886, are fixed for the redemption of the gas and water debt, stand as follows: On gas account, 45 years from June 29, 1885; on water account, 47 years from the like period. By the Consent Order of the Local Government Board to the issue of stock, dated May 30, 1895, the above periods are, however, fixed as to £34,288 12s. 7d. (gas-works) at 32 years from June 29, 1895, and as to £80,226 17s. 5d. (water-works) at 37 years from the same date. To the latter figures must also be added the proportionate part of the cost of the issue of the stock.

Your Sub-Committee have also had submitted to them a statement prepared by the Town Clerk as to the provisions in force with respect to the redemption of gas and water debts in other towns, and the information afforded by the same showed that Widnes is in a totally different position to the authorities of the other towns in the kingdom, who are permitted in every case to devote their surplus gas and water revenues to the purposes best suited to the interests for the time being of the particular place. In the opinion of this Committee some arrangement such as that quoted is only fair and equitable in the case of undertakings of the substantial and lasting character of gas and water works, which are uniformly maintained in a state of thorough efficiency out of income, and the benefits from which will therefore be enjoyed by people living at a much later date, equally with those of the present day. It is therefore not reasonable that the present generation should bear a greater burden than is imposed upon them by providing for the extinguishment of the debt by the sinking funds.

Your Sub-Committee are also informed that the provision as to payment off of mortgages except by sinking fund is inconvenient, and to a certain extent impracticable, for the reason that the due dates of the mortgages cannot be generally made to suit the periods when surpluses are available; and, of course, so far as the debts are consolidated and covered by Widnes 3 per cent. stock, the mortgages have ceased to exist, and the amount represented by these securities can therefore only be redeemed by means of the redemption fund in connection with such stock.

Your Sub-Committee are advised that the necessary amendment of the Local Acts to bring Widnes into line with the other towns owning gas and water works, can be made by the Local Government Board; and they therefore recommend that an application should be made for a Provisional Order striking out the provision requiring the payment off of principal moneys secured by gas-works and water-works mortgages, otherwise than by means of the sinking funds, and for making any other amendments or alterations in the Local Acts rendered necessary by the above alterations.

The Finance Committee had the foregoing report before them at their meeting on the 7th inst., with the result that they passed the following resolution: "That the report of the Sub-Committee be adopted; and that the Local Government Board be asked to repeal, alter, or amend the Widnes Improvement Act, 1867, so far as the same provides for the application of the gas-works and water-works funds respectively in the payment off of the principal moneys secured by gas-works and water-works mortgages respectively, in addition to setting apart the respective sinking funds for payment off of the said mortgages; and that the Town Clerk be and is hereby instructed to take all such steps as he may deem necessary for obtaining a Provisional Order for the purpose, and the confirmation thereof by Parliament."

Mr. OWENS, the Chairman of the Finance Committee, in moving the adoption of the minutes, said he hardly expected to carry every member of the Council with him; the question of paramount importance being the resolution bearing upon the gas and water funds. As the account now stood, any surplus income, after providing adequately for the maintenance of the undertakings, must be devoted to paying off the capital debt. The Committee were of opinion that some modification ought to be made in this respect. The sinking funds adequately provided for paying off the capital debt; and any surplus that arose should come within the scope and direction of the Council. They were not so original and independent that they could afford to ignore what other boroughs and cities did. Some time ago the Town Clerk put himself in communication with a great number of towns; and he discovered that, with one exception, Widnes in this respect stood out in splendid isolation from all other cities and boroughs, who placed the surplus at the disposal of their councils to be devoted for public purposes, or as they thought fit. Some of them might say that there ought to be no surplus. Well, he thought it was a very desirable position for any individual or corporation to be in to have a fund at their disposal. He begged the Council not to conjure up any strange ideas that the Committee purposed laying violent hands upon that which did not belong to them. He would, with all the vehemence of which he was capable, deprecate using even a proportion of the sum for the purpose of reducing the rates, or devoting the surplus to any public purpose at the expense of the gas consumers, who should be the first consideration. But he must remind them that these undertakings belonged to the borough. They existed in the main for the benefit of the gas consumers and users of water; but the burgesses had also a right to participate in the benefits which accrued from them. They desired to be brought into line with other cities and boroughs; and to have the privileges and prerogatives they possessed; and they asked the Council and the burgesses to trust them in this matter.

Mr. BARLOW seconded the motion.

Alderman TIMMIS, the Chairman of the Gas and Water Committee, asked that the matter might be taken back for a month, as they had not had time for its discussion.

Mr. OWENS remarked that seeing that Alderman Timmis had had since July to consider the matter, he ought to have brought forward something directly bearing upon it, and supported his application by facts and figures. He (Mr. Owens) had no authority from his Committee to take the recommendation back. There were nine members at the meeting, and eight of them were perfectly satisfied that what was proposed was the right thing to do. He had no desire to "rush" the matter, but he must have regard to his Committee, and they ought not to be asked to postpone, delay, or take back measures which he contended every one had fully deliberated and felt satisfied upon.

Alderman TIMMIS said he was not a member of the Sub-Committee, and what their proposals were he never knew until he received the minutes the previous morning. If the Chairman of the Finance Committee wished to stifle discussion, he was satisfied; and he would propose the rejection of the recommendation when he had their decision.

A pause ensued, which was broken by the MAYOR asking if there was any amendment to the minutes.

Alderman TIMMIS: Do I understand it is not being considered whether to take the minute back for a month?

The MAYOR: The Chairman has not withdrawn it, and I ask an amendment.

Alderman TIMMIS then proposed, as an amendment, that the minute in question be struck out, saying that if he found a seconder, he would then give his reasons.

The MAYOR: You must give your reasons in moving it.

Alderman TIMMIS said he would do so. He then proceeded to say that he felt it would have been an act of courtesy if the motion had been submitted to the Gas and Water Committee before it was brought to the Council. To his mind, this was an attempt to rush a very important change through without proper discussion; and it ought to have been brought forward as a special motion. He expected to be told that this was no concern of the Gas Committee. But he felt that it might materially affect the selling price of gas and the prosperity of the town; and consequently it required deep consideration. They ought to have a fair discussion, and be allowed time to get up their facts. If they carried the proposal through now, he maintained that the discussion would be a farce, and that the interests of the borough would suffer. With regard to the few points he had been able to put down, as a representative of a firm which paid the largest rate of any single works in Widnes, he might say at once that they entirely disapproved of the resolution. In his opinion it was a deliberate attempt to rob the working men and gas consumers for the benefit of the owners of property, as it had been brought forward by men who, they knew, sat on the Council as the representatives of small property-owners, and gave no thought to those whose votes sent them there. To begin with, he asked the Chairman of the Finance Committee what was the meaning of the paragraph referring to the dates when certain sums had to be repaid on the gas and water accounts. These sums he did not understand; nor did he know how they were arrived at, unless it was for the purpose of creating a false impression. They were only about half the total indebtedness of the undertakings; the actual figures being: Gas, £64,387; water, £160,190. He would therefore ask the Chairman of the Finance Committee what they had done with half the indebtedness, and how they proposed to pay it. Did they propose to carry it forward, and leave it as a legacy to posterity? Then turning to the following paragraph, he said deliberately that the statements contained therein were erroneous; that wrong conclusions were drawn from them; and that, in his opinion, those conclusions were a deliberate attempt to throw dust in the eyes of the Council. The statements might be literally accurate; but they did not give him time to prove them or otherwise. He believed they had been manipulated to give a wrong impression.

The MAYOR remarked that this was very strong language.

Alderman TIMMIS acknowledged that it was; but he said the case demanded it. He found stated in the paragraph referred to that the authorities in other towns were differently situated from Widnes; and the Chairman of the Finance Committee said Widnes stood isolated. The industries of other towns were of a more permanent character. Widnes depended almost entirely upon the alkali industry, of the uncertainties of which they unfortunately had ample proof before their eyes; and the only safe policy for Widnes was to keep its floating debt as low as possible. It was further asserted that Widnes was in a totally different position from other towns in regard to revenue. This might or might not be true. Personally, he should imagine they were not the only town unable to devote their "surplus gas and water revenue to the purposes best suited for the time being to the particular place." He should like to see this statement verified; and he must absolutely decline to believe it. He knew there were a great number of towns which had this power, but did not exercise it, on the ground that they did not consider it fair to the gas consumers to do so—in other words, they did not consider it fair to benefit landlords and non-consumers at the expense of the consumers. Many towns which formerly drew large sums out of the profits were each year taking less, having

proved the fallacy of the custom. Of this, Manchester was a very striking example. Further than that, there was no town thus using the profits which was able to sell gas within 20 per cent. of the present price of that illuminant in Widnes; and he asked why the Committee had avoided mentioning this simple fact. The report then said that an arrangement such as that proposed was only equitable in the case of undertakings of the substantial and lasting character of gas and water works. Judging from the report, the gas and water profits were not available for the relief of the general district rate in Widnes. It would doubtless, therefore, be information for the Sub-Committee to know that, without these powers, they were at the present time appropriating a greater proportion of the gas profits for the relief of the rates than many of the towns which were entitled by their gas powers to do so. In support of this statement, he would quote Birmingham and Oldham—the former taking 1·62d. and the latter 2·1d. per 1000 cubic feet of gas sold, while in Widnes they took for public lighting nearly 3d. per 1000 cubic feet; and if the cost of the lighting went on increasing at the rate it had done for the last few years, this sum would be largely increased. Then by the misnomer, "of the lasting and substantial character of gas and water works," he supposed they referred to the profits, which they were anxious to grab. But there were grave contingencies to be considered, such as coal strikes and loss of consumers; and if such contingencies arose, and profits were not forthcoming, having once "tasted blood" they would no doubt enforce taking the profits if they did not demand more, and insist upon increasing the selling price, which would at once mean a loss of consumers, especially among the works, which were their principal customers. In fact, twelve works at present took half the production; while they had nearly 4000 consumers. The United Alkali Company, for instance, would no doubt start the various gas plants which they were induced to stop because of the low price of the Corporation gas; or they would, which was more likely, put in electricity. As far as his own firm was concerned, they would do so; and their consumption was one-twelfth of the entire consumption of the borough. Should these contingencies arise, and the consumers decrease, where was the money to come from for the sinking fund and profits? They would have to raise the price, and he said to the working-men consumers and the tradesmen that this would practically add to their rent for the benefit of the landlords and the building societies, who would get reduced rates through the increased profits. He altogether doubted, however, whether they would get reduced rates, because this policy had always led to extravagance. The Chairman of the Finance Committee had referred to the amount of money which he did not wish to appropriate. But it was a dangerous practice to appropriate anything; and if they were to appropriate the profits and reduce the rates, the landlords would never give the consumers a corresponding reduction in rents. The Sub-Committee next said it was not reasonable that the present generation should bear a greater burden than was imposed upon them by providing for the extinguishing of the debt by means of the sinking fund. Might he ask what burden they did bear, or what their predecessors had borne? When had the ratepayers outside the consumers provided a penny piece for this purpose? [Alderman WILLIAMSON: Never once.] They had never been asked to pay anything; and this was a bald statement they could not prove. They had a fine property, which had been handed down to them by able men in the past, whose advice they had taken with acclamation and to their advantage. This property these gentlemen, in their wisdom had fenced round by Acts of Parliament, for they foresaw that the present proposal would be advocated; and to this saving clause the town was indebted for the present efficiency of the gas and water undertakings. He had heard from a member of the Sub-Committee that this question was settled in less than an hour, and not unanimously; and yet after this imperfect consideration, they proposed, with childlike simplicity, to override the wisdom of the intellectual giants who had preceded them. If there was a surplus, by all means make use of it in a fair and equitable way. Nearly three-fourths of the householders in the borough were gas consumers; and it was to these people, who actually found the surplus, that relief should be given, not to the non-gas consumers, non-resident landlords, railway companies, building societies, and clubs, who would take everything out and bring nothing in. If money was needed for the requirements of the borough, let it be fairly and honestly raised by the district rate, as it was only right that every ratepayer should contribute his fair proportion if it was for the benefit of all. But it was distinctly unfair that one class should be unjustly taxed for the benefit of another. He had used hard words, but the proposal was a monstrous one; and in his opinion his words were justified. If the Council did not take the same view that he did, he had nothing further to say. He asked them to vote for the maintenance of the present policy, which had worked well in the past, and had proved itself to be for the welfare of Widnes.

Alderman WILLIAMSON seconded the amendment. He urged that the matter should be postponed, as, though the Sub-Committee were appointed in July, they had, he said, never discussed the question till the previous Tuesday afternoon. The Town Clerk produced a report which he did not read; but it was signed by the Chairman, and afterwards read to the Committee. Why, he asked, were they rushing this matter through? Mr. Owens practically said they did not want to interfere with the gas and water funds; they only wanted the power. The probability, however, was that if they had the power they would take advantage of it to ease the rates. With regard to the effect of higher rates as compared with an increase in the price of gas, he pointed out that a penny rate meant £17 12s. 8d. per annum to Messrs. Gossage and Sons, whereas an increase of 1d. per 1000 cubic feet of gas meant £56 12s. 8d. per annum, or a difference of £40. At the present time the public lighting cost that firm, through the increased price they had to pay for gas, £120 a year, which was an unjust charge to place upon any firm or anybody. There were something like 5000 inhabited houses in the town. There were about 2000 consumers of gas by automatic prepayment meters, about 1000 householders were ordinary consumers, and about 1000 shopkeepers were gas consumers; thus making 4000 consumers out of a total of 5000 occupiers. The average consumption of the "slot" meter and ordinary consumers was about 11,000 cubic feet per annum; and a reduction or an increase of 1d. per 1000 cubic feet meant £1374 2s. a year to these consumers—an amount of between 2d. and 3d. in pound upon the rates. Then the average consumption of the shopkeepers was 80,000 cubic feet per annum; and 1d. per 1000 cubic feet meant £333 6s. 8d. to them. The ordinary householders did not pay their rates direct, but they were paid by the property owners; and, as a consequence, if they raised the price of gas 1d. per 1000 cubic feet, and devoted the extra profits to relieving the rates, the £1374 2s. which would accrue from the ordinary householder and "slot" meter consumers would go into the pockets of the property owners. As to the shopkeepers who paid their own rates, they were, on the average, rated at £20; so that if they relieved the rates by 1d. in the pound, the shopkeepers would benefit to the extent of 1s. 8d. per annum; but if they took off 1d. per 1000 cubic feet in the price of gas, they would benefit to the extent of 6s. 8d. per annum. This was an important matter for householders and tradesmen, as well as for the manufacturers; and the prospect of an increase in the price of gas would be a consideration for manufacturers who might be coming to the town. He contended that there had not been sufficient discussion of this question, and that they would lose nothing by waiting for another month. If they went into it thoroughly, perhaps they would better understand the position Alderman Timmis had taken up.

Mr. QUINN said that, as a member of the Sub-Committee, he threw back the statement to Alderman Timmis that they were acting as property owners and their representatives. He represented the burgesses—or at least he endeavoured to do so; and in according his support to the resolution, he did so believing that it would be beneficial to the burgesses at large.

Mr. OWENS, in reply, expressed regret that the personal element had been introduced into the discussion. Unfortunately for him, he had the honour to be Chairman of the Finance Committee; and he denied that he represented any party but the burgesses who elected him. He came there at great sacrifice of time; and he had no interest to serve but the highest—that of the burgesses. The speeches they had heard had been no answer to the resolution. Alderman Williamson thought the Sub-Committee had not had sufficient time to consider the matter. It was not for him to say so; but surely they would give the other eight representatives on the Finance Committee credit for honesty in this matter. They said they had understood the measure, and were satisfied. They had no less than three members of the Gas Committee on the Sub-Committee; and a majority of these came to the same conclusion as the majority of the Committee itself. What were they seeking to do? What had they a right to expect? They had the right to expect that they should be allowed to have legitimate, proper, and adequate authority which became them as a corporate body. He (Mr. Owens) would be the last man to interfere with offering gas and water at the lowest possible prices consistent with paying for their production; and his whole aim and object would be to keep Windes in the chief place for doing this, and to offer every inducement to manufacturers and capitalists to come into the town, and make it more important as an industrial centre.

A vote was then taken upon the amendment, which was defeated by a large majority; and the minutes were passed as submitted.

MIDDLESBROUGH CORPORATION GAS SUPPLY.

The Condition of the Gas-Work.

At the Meeting of the Middlesbrough Town Council last Tuesday, the present unsatisfactory position of the gas undertaking of the Corporation was brought under the notice of the members. The Gas Committee reported that a letter had been received from Sir Railton Dixon and Co., complaining of the insufficient supply of gas to their yard, and stating that, unless something was done to remedy this, the works would have to be stopped. The Gas Manager (Mr. D. Terrace) reported that something should be done at once; and it was decided that an 18-inch main, 400 yards in length, should be laid, at an estimated cost of £350.

Alderman HUGH BELL, the Chairman of the Gas Committee, in moving the adoption of the minutes, made a lengthy statement as to the condition of affairs at the gas-works. He said that some time ago, on his being obliged to leave England for the benefit of his health, he desired to place his resignation in the hands of the Committee, in order that they might put someone in his place permanently. But the Committee were so kind as to postpone accepting the resignation until after his return, possibly in the hope that it would be withdrawn. He could not omit to thank them for this consideration. But he thought that, in showing it, they had greviously injured the public interest, and the result had been that for about four months the Committee had been at the mercy of a temporary Chairman. There had been no one who had in his hands all the lines of the gas-works, and who felt that he was responsible for what was taking place there. Immediately on his (Alderman Bell's) return three or four weeks ago, he examined the minutes of the Committee; and he was sorry to say he found displayed therein a state of matters which filled him with sorrow. Work which should have been done months ago was in exactly the same position as it was when he was obliged to vacate the chair. He found in addition that the discipline had been so seriously relaxed as to place the manufacturing process in a very unfavourable condition. He next visited the works, and his fears were confirmed. The Council would be aware that a year ago he, as Chairman of the Committee, urged upon the Committee the perilous position in which the town stood with regard to its gas supply, and pointed out that it would be absolutely necessary, before the dark days of 1896 came upon them, very considerably to strengthen it. The Committee and the Council duly considered the position, and came to a decision thereon. Now, in the ordinary course of events, the work which was decided upon should have been well on towards completion at the present time; but he found that a great deal of it was not commenced. He did not, however, say the officials at the gas-works or the present Chairman should be held responsible for the unpleasantness or disaster that might come upon them during the

ensuing winter. Turning to the question of discipline, he would mention only one case, but he would also state that the condition of affairs which characterized the manufacturing process was also characteristic of the discipline. When he went away, the production of gas per mouthpiece amounted to 8000 cubic feet; but now practically every retort in the old house was at work at the beginning of the present month, whereas they should not have been in this position for some months to come. From now till this time next year, or certainly no longer that eighteen months hence, the Committee were bound to increase the works to a very considerable extent, in order to meet the growing demands of the town. This fact had been pointed out to them for many years past; and in 1892 they obtained powers from Parliament to enable them to make a very great additional outlay upon the gas-works. During the next eighteen months, a very large expenditure would have to be incurred; and it would be necessary to have someone responsible to advise the Committee as to how it should be undertaken. Gas manufacture was going through rapid and very curious changes; and it would be requisite for someone to advise, to the best of his ability, as to the way in which these changes should be adopted in the works. It would be necessary to have somebody as Chairman who would have interest and determination enough, and be prepared to spend considerable time and trouble in bringing into shape things which were at present so much out of order, and in seeing that the necessary work was properly and efficiently carried out in the future. He mentioned this in order that the Committee could be prepared to elect a Chairman who would be ready to take up the duties for which he (Alderman Bell) felt himself unqualified.

Mr. BENFIELD seconded the motion.

Mr. BAKER raised a question respecting the treatment of certain men at the gas-works.

The Council decided to discuss the matter in private, and excluded the members of the Press and also the officials of the Corporation.

Eventually the minutes of the Committee were adopted.

THE DANGERS OF ACETYLENE.

Fatal Explosion in Paris.

A terrible accident took place in Paris last Saturday afternoon, on the slope of Montmartre, in a building where for two months M. Raoul Pictet has been manufacturing acetylene, large quantities of which he sold to shopkeepers and others. According to the account of the occurrence which appeared in "The Times" yesterday, one of the steel tubes, 3 feet long, used for storing the new gas, exploded. Fortunately it was the dinner hour, and only three workmen were on the premises. One of them was the stoker, who was preparing for the resumption of work, while the other two men were examining tubes which had been returned. Such was the violence of the explosion, that the building was blown up and the windows of all the neighbouring houses were shattered. The workmen, policemen, and the people living near hurried to the spot, and found the bodies of the two workmen fearfully burnt and mutilated. The stoker was knocked down and covered with fragments of glass and wood, but was only slightly hurt. It has been ascertained from the fragments that the tube which exploded and which was practically full was returned from Brussels on the 13th inst. along with 74 empty ones. It is believed that the workman either held a lamp near it or was unscrewing the stopper with such force as to produce heat. In another part of the premises there were 30 tubes, each containing 26 gallons of acetylene, as also two large reservoirs, one containing 500 gallons. Fortunately the force of the explosion went in another direction. The workshop was only a temporary one, and was indeed styled a laboratory; so that no regulations had been imposed on it by the authorities. A scheme of regulations for acetylene factories has, it is reported, been for two months in the pigeon-holes of the Council of State; but it will now, no doubt, be promptly considered, and such factories will be banished outside Paris.

The "Daily Telegraph" correspondent, referring to the catastrophe, said: "According to the evidence collected, it appears that one of the workmen—Pierre Pautre—was engaged in manipulating a '*bonbonne*,' or cylinder-shaped receptacle of liquefied acetylene gas, when it burst, through contact with the flame of a lamp. The note issued by the Company (or, as it is called, the Institut Pictet) states that the explosion was luckily limited, as it did not touch two large gasometers filled with acetylene, nor the shop where further supplies of the gas were stored."

ELECTRIC LIGHTING NOTES.

Before venturing into the business of electric lighting supply, the Withington District Council have taken the sensible course of investigating the opinion of the ratepayers on the subject. They issued inquiry circulars to the owners and occupiers of houses of the yearly value of £30 and upwards, with the result that more than 600 persons favoured the adoption of the light, and, of more importance, upwards of 400 signified their intention of becoming customers. With such an amount of support, the Council felt justified in deciding to apply to the Board of Trade for a Provisional Order, to enable them to provide the necessary works.

The Rochdale Corporation have not yet undertaken the supply of electricity; and consequently, until recently, the progress of electric lighting in the district has been slow. But a spurt has lately set in in the installation of private electrical plants; and now there are about thirty important mills, shops, &c., in the district lighted by this method. These, of course, will form an important factor in estimating the results to be derived from a central station supply. An article, the principal intent of which is to show the expansion of electric lighting in the borough by means of private installations, has appeared in the "Rochdale Observer." In his introductory remarks, the writer falls into the common error of most newspaper writers when dealing with this subject, of making assertions without any attempt at proof. For example, he advances the bald statement that the electric light is not only a "safer, cleaner, healthier, and more powerful method of producing artificial light, but cheaper as well." He then goes on to describe the particular respects in which the light is found advantageous (apart from cost) in several local mills, which he names. In dyeing works, the electric light claims precedence of gas in enabling the accurate judging of colours, owing to the great predominance of yellow rays in the latter. Then the work carried on in "raising mills" is of a nature which causes a great amount of fluff to be constantly flying about the air, and covering almost everything in the works with a small coating. Naked flames are therefore dangerous; and consequently the electric light is coming into general use in such places. In corn mills, it has been adopted for the same reason. An extension of an installation at the Butt's mills of the local firm of Messrs. Kelsall and Kemp will make it one of the largest in the district—consisting, as it will do, of 1500 lights. Among the varied places of business mentioned as having adopted the light are also weaving-sheds, paper-mills, and machine-works. In connection with the last class of works, it is stated that Messrs. Tweedales and Smalley, of Castleton, are using electricity for traction purposes and also for driving the machinery in many departments. The local tradesmen have not shown any great eagerness to instal the light; but a few instances are given. One of the shopkeepers—Mr. T. Woolfenden, of Cheetham Street—in April last engaged the National Gas-Engine Company, of Ashton-under-Lyne, to put down the plant necessary for lighting his premises; and his testimony is to the effect that he finds he can get about 100 times the candle power at the same cost, with the advantages of a cleaner light, a healthier atmosphere, and no damage to his goods. The article closes by mentioning that the Corporation possess electrical installations at their sewage farm and sanitary works; and the Free Library is also to be lighted in the same manner.

Major-General Crozier has been inquiring into an application by the Oldham Corporation for the sanction of the Local Government Board to the borrowing of £10,000 required for electric light purposes. The Town Clerk (Mr. A. Nicholson) supplied him with a detailed account of the progress of the concern, in order to show that the Corporation were warranted in proceeding with further extensions. The second year's working, he said, was completed in March, 1896; and the results were as follows: The gross revenue for the year amounted to £3847; and the gross expenditure to £1578—leaving a balance of £2269. The amount of interest paid on loans was £813; and the payment to sinking fund for the redemption of loans was £608. The net profit for the year was £847, as against a net loss of £152 on the first year's working. The price charged for energy was 6d. per unit, as in the previous year; but the minimum quarterly charge for energy had been reduced from 10s. to 5s., and the charges for meter-rent had also been lowered. The Corporation had also reduced the price for electric current used by private consumers in excess of two hours' daily average maximum consumption to 4½d. per unit, and all current consumed by public street-lamps to 4d. per unit. The number of consumers on Sept. 25 was 138. The number on March 25 last was 113, as against 55 on March 25, 1895—an increase of 58. The number of lights equivalent to 8-candle power on Sept. 25 was 13,866. The number on March 25 last was 11,830, as against 6940 on the corresponding date of 1895—an increase of 4890. The amount of energy sold to consumers during the year ending March 25 last was 147,432 units, as against 68,988 units in the previous year—showing an increase of 78,434 units. The total borrowing powers are £42,000; and the total expenditure to Sept. 25 was £35,820. This leaves £6179 to be borrowed; and out of it there has to be paid for laying mains a sum of about £4000. With regard to the present application, the Town Clerk stated that it was proposed to provide additional boilers, with condensing plant and special water apparatus, and a dynamo, at a cost altogether of about £5000. It was also intended to double the size of the buildings. The Consulting Engineer (Professor Kennedy) gave evidence as to the extensions, and mentioned that the present plant was now fully occupied. Questioned as to what proportion of the profits was derived from the supply of electricity to municipal buildings, the Town Clerk presented a statement showing that during the year ended March 25 last, the total value of electric energy supplied was £3688—£2779 to outside consumers, £651 to municipal buildings, and £257 to street-lamps. Applications for borrowing powers in connection with other departments of municipal work then received attention.

In view of the enormously increased popularity of the Isle of Man as a holiday resort, it is only natural that those who have large interests in it should strive to add to its many natural charms such attractions as will conduce to the visitors' enjoyment. One of these is unquestionably efficient public lighting. The Loch Promenade at Douglas has already afforded the Gas Company scope in this direction; and they have shown what they can do. Now that the summer season is over, leisure is afforded to consider what can be done for the next; and the Town Council have had this matter forced upon them by an offer from the Company to light the streets with incandescent gas-burners. They have not accepted the offer—whether wisely or otherwise time will show—but have turned their attention to the electric light. Blackpool, Fleetwood, and Southport, as well as other important watering-places, have this light; and why, it is asked, should not Douglas? True, at Blackpool the £49,000 sunk in the undertaking only produced £281 profit at the end of the second year; while at Southport there was a loss on the £36,700 of capital at the end of the first year. But at other places profits are shown; and why should the installation in Douglas not be attended by similar satisfactory results? This is the strain in which the advocates of electric lighting talk; and they support their arguments by figures. They think that for £10,000 an installation of plant could be established which would light the promenade with arc lamps and provide sufficient engine power and mains to enable 6000 incandescent lamps of 8-candle power to be connected. These at 5s. each per annum would produce £1500; and 37 arc lamps at £15 each, £525 more—making £2025. The estimated expenditure would be: Working expenses, £1100; interest and sinking fund, £500—total, £1600. This very pretty little estimate shows a profit of £425, which, it is urged, would go in reduction of the rates; but we question if the whole of this would be realized. However, a Committee of the Town Council have the lighting question under their consideration; and they are being advised by

Mr. S. V. Clirehugh. This gentleman has so far convinced the Committee that they will probably ask the Council to authorize them to employ him to present a report on the subject. In the meantime, public sentiment is being strongly appealed to in the local Press.

"The Financial Statement to the 10th October, 1896," presented to the St. Pancras Vestry last Wednesday, is brutally frank in its reference to the electric lighting of the parish. These three extracts from the statement are instructive: (1) "Due to rates account, King's Road station electric lighting and refuse destructor account, £5843 0s. 6d." (2) "Electricity account, Regent's Park station—Receipts since Lady-day, 1896, £10,678 17s. 3d.; payments since that date, £34,464 10s. 8d.; balance overdrawn, £23,785 13s. 5d." (3) "Electricity account, King's Road station—Receipts since Lady-day, 1896, £1344 2s. 6d.; payments since that date, £15,340 15s. 6d.; balance overdrawn, £13,996 13s." The Committee also reported that they had drawn various cheques amounting to £1815 for electric lighting material. A curious statement was made by Mr. Cox, the Chairman of the Committee, replying to a member's query as to the wages paid to the lamplighters, to the effect that "the introduction of electricity in the parish had caused no diminution in the number of gas-lamps used." This is good news to the lamplighters and gas companies; but surely the ratepayers will be somewhat surprised. The Vestry then proceeded to levy the lighting-rate for the half year ending Lady-day, 1897. In the statement supplied, it appears that the assets are: Cash in hand, £1082; amount due for gas to private consumers, £110; estimated value of stock, £600—together, £1792—and that the liabilities (including £700 due to the Electricity Department) amount to £2655; leaving a balance of £865 to be provided. To this is added the following estimated requirements to Lady-day, 1897: Gas Company for gas supplied, £5700; Electricity Department for electric current, £1815; materials for maintenance, £100; wages and management expenses, £1750; miscellaneous, £43—total, £9408. The Vestry thereupon decided to levy a rate of 1½d. in the pound, which will produce £9561. This is a rise of ½d. in the pound since last half year. If this is the state of things where gas is still used, and electricity has not yet monopolized all the street or private lighting, what will happen when gas companies are no more, and the St. Pancras Vestry's Electric Lighting Department is in sole possession? Some enthusiasts say that the department would then contribute largely to the relief of the rates. To such people we commend the above extracts from the financial statement.

The Gas and Electric Lighting Committee of the Wigan Corporation have advised the Council to postpone the introduction of the electric light into the town. Their decision is based particularly on two reasons. The first is that a new burden will shortly be coming upon the ratepayers by the introduction of an additional water supply; and the second, that the trade of the town is in a bad state. As to the latter, the coal industry of the district is in a very depressed condition; and this, naturally, has an ill-effect on business in the town. Consequently, as it is to the shopkeepers that the Committee would have to look for support, they consider that, if they undertook the supply of electricity at the present time, it would prove a financial failure.

Last Wednesday, the Bootle Town Council discussed a report of the Watch Committee dealing with the question of introducing the electric light into the borough. It was recommended that the Council should retain the supply, put their powers into force, select a site for a generating station, and obtain expert assistance. The adoption of the report, which was moved by the Mayor (Mr. I. A. Monk), was opposed among others by Mr. Hall, who suggested that it should be referred back for a month or two, on the ground that, although the Committee had taken a year for its preparation, they had only allowed the Council a day for its consideration. He had examined the figures the Committee had advanced in support of their proposals, and found they were misleading. It was stated that there would be a profit of more than £1000 in the first year; but this, he pointed out, would, on deducting interest and depreciation, be turned into a loss of £59. Mr. Henry, who moved that the report be referred back, opposed it on somewhat novel grounds. He was of opinion that in so far as they created a demand for the electric light, they would reduce the demand for gas, which would lead to the dismissal of men from the gas-works—involving injury to them and to the tradesmen with whom they dealt. Mr. Brewster characterized this argument as fallacious; pointing out that wherever electric lighting had been introduced, the experience was that the consumption of gas continued to develop. Two or three other members spoke in support of the Committee; and, on the Mayor pointing out that the report did not pledge the Council to any definite action, the amendment was withdrawn, and the motion adopted.

The electric lighting question is once more to the front at Ipswich. The matter has been before the Town Council at intervals for the past three or four years. In 1894, they sought the advice of Professor Kennedy in regard to it; but his report, although favourable to electric lighting, did not then result in further steps being taken. Subsequently, as is generally known, incandescent gas-lamps were adopted for the lighting of the streets; and they have given much satisfaction. Notwithstanding, many of the inhabitants still hanker after the electric light; and at the end of December last, the Council again appointed a Committee to make inquiries as to the best course to be pursued in providing a supply. A further estimate has since been obtained from Professor Kennedy as to the cost of an installation. An area of supply was selected; and he computed the necessary expenditure therefor at £30,200, made up of: Capital outlay, £25,000; extra for public lighting, £2500; professional fees and commission, £1500; cost of Provisional Order, £350; and sundries, £350. For an enlarged area, containing some eighteen additional roads, he put the expenditure at £41,900. The report came before the Town Council at their meeting last Wednesday, when, on the motion of Mr. J. Pratt, the Electric Lighting Committee were instructed to take all necessary steps to enable the Corporation to apply for a Provisional Order to give them power to supply electricity in the larger of the two areas.

The Bradford Corporation Gas and Electricity Committee have decided upon a novel method of making a concession to consumers of electricity. They have arranged to supply incandescent electric lamps to all users free of cost; the conditions being that such lamps should burn for 1000 hours, or have used 60 units during their life. This is equivalent to a reduction of about ½d. per unit.

SHEFFIELD CORPORATION WATER SCHEME.

Mr. Eaton's Commission and Position.

The agitation which has been going on at Sheffield in regard to the proposals of the Water Committee as to Mr. Eaton's position and remuneration in connection with the Little Don water scheme has received fresh impetus by the issue of a further report on the question after a meeting of a Sub-Committee on Tuesday last. The report read as follows: "With regard to the engineering of the Little Don Valley works, the Committee wish to observe that the recommendation in their report of Sept. 2 probably would have worked out about thus—Expenditure on works during the first five years, as per parliamentary estimate, £351,000 at 4 per cent. commission, £14,000, or an average of £2800 per year, less estimated payments therefrom for draughtsmen, assistants, and expenses—say, £1400 a year—leaving net £1400 per year average. Add the proposed salary as Consulting Engineer for the existing works—£250—it shows that that arrangement would have resulted, so far as can be estimated, in a net payment of about £1650 a year to Mr. Eaton, as against £1200 at present. In view, however, of a decided preference which has been expressed by members of the Council for fixed salary with payment of the draughtsmen and assistants and expenses directly by the Corporation, it is now proposed to adopt that system, and also to effect still further economy by providing that the net salary payable to Mr. Eaton be only £1200 per year, as at present, upon terms set out in the following resolution, which also expresses the intention that there be no limit to the number of days Mr. Eaton engages to devote to the work, but that he devote whatever time may be necessary for efficient designing and superintendence. With regard to the alternative of an engineer in the exclusive service of the Corporation, the Committee desire to say that such system has not been usual at the great water-works in this country, and either would be a wasteful expenditure of high-class experience, or, if a moderate sum only were offered, no man of equal experience and repute would be obtained." The following is the resolution referred to: "That Mr. Eaton's existing service with the Corporation, at £1200 per year, be varied, from Nov. 1, 1896, as follows—He to fulfil the duties of both consulting engineer and designing and constructing engineer for the new Little Don works; the Corporation providing the usual resident engineer in actual residence upon the works, and the payments for assistants, inspectors, draughtsmen, and clerks, and out-of-pocket expenses, the engagement to include all assistance required from Mr. Eaton in connection with the acquisition of the lands and easements for the works, and in respect of any parliamentary proceedings respecting the Knoll Brook scheme. Also, he to discharge the duties of consulting engineer on all matters connected with the existing water-works of the Corporation and the distribution of the water, and relating to completion of the Damflask reservoir. The fulfilment of his duties in respect of the above engagement to be the first claim upon his time and attention, and he to devote all the time necessary to the prompt and energetic discharge thereof. Subject to the foregoing, he to be at liberty to act as a practising engineer. This engagement to be either for a term of five years, by which time it is expected that the Langsett reservoir and the works connected therewith will be completed or almost so; or upon twelve months' notice from either side, as the Council may prefer."

The report has provoked further newspaper criticism and correspondence on the subject. Two important letters have appeared from Alderman Gainsford; their main object being to clear away some of the misunderstanding and misconception which has arisen. He declares that Mr. Eaton has desired to enter upon private practice as a Consulting Engineer for many years, and makes plain, by comparative tables, that, under the circumstances, the Committee's present proposals are the most economical that can be adopted. Alderman Gainsford receives the support of Sir John Fowler, who was Consulting Engineer to the Corporation during the late parliamentary proceedings, and who vindicates the action of the Committee in regard to Mr. Eaton. From a letter of Mr. Harry Fisher, it appears that the amended report does not receive the united support of the Water Committee; the voting upon it being eight for and six against. The number of members constituting the Committee is fifteen.

BIRMINGHAM CORPORATION WATER SUPPLY.

Progress of the Welsh Scheme.

The Water Committee of the Birmingham Corporation, accompanied by the Lord Mayor (Mr. J. Smith), the Town Clerk (Mr. E. O. Smith), the Chairman (Alderman Lawley Parker), the Secretary (Mr. A. Lees), and the Engineer (Mr. J. Mansergh, M.Inst.C.E.), have lately visited the works in progress in connection with the Welsh water scheme of the Corporation. The length of aqueduct inspected was the ten miles between Dolan and Knighton, which was let more than two years ago to Messrs. Morrison and Mason, of Glasgow. It was put in hand thus early because, with the exception of the immense masonry dams upon the Elan, the Dolan tunnel, 4¼ miles in length, was the work that would occupy the longest time in execution. The Resident Engineer in charge is Mr. W. A. Brightmore, who was previously engaged upon an important section of the Vyrnwy works of the Liverpool Corporation. The first part of the work inspected was the inlet chamber of the Downton syphon. This is the point where a length of "cut and cover" conduit on the hydraulic gradient line is connected to the iron pipes which cross a depression below that line. Provision is made in this chamber for the whole six pipes which will ultimately be laid, though for the first instalment of 27 million gallons a day only two will be required. These pipes are of 42 inches internal diameter, with an effective fall of 3 feet in a mile. The conduit in cut and cover or tunnel is 8 feet high and 8½ feet wide at the springing of the arch, and has a gradient of 1 in 4000, or 16 inches in a mile. It is constructed of concrete, faced on the invert and side walls with blue Staffordshire bricks. Descending into the conduit at the inlet chamber, the party walked along it for

about a mile, coming out to inspect the bridges crossing the Frydd Wood and Gwern Afol Brooks, and finally emerging at the east end of the Knighton tunnel. The tunnel has now been driven about 1300 yards from this end. Its total length is 2½ miles; but time could not be spared to walk up to the working face. The party drove over the high ridge through which the tunnel is being made; and after examining the west end, from which also a length of 1300 yards has been driven, walked across the valley of the River Lugg, in which the two 42-inch mains have been laid, and inspected the crossing of that river, which is effected by two steel tubes of about 35 feet span. The inlet chamber to this syphon was found to be about half finished; and after seeing it and the overflow chamber, a little to the west, a further length of about 1¼ miles of aqueduct was traversed, including the Pantywar tunnel, the invert and side walls of which are being built, but as yet none of the arch. The carriages were again taken, and the Bleddfa shaft, at the east end of the Dolan tunnel, and the deep shaft (280 feet) at the Craig Gorge were pointed out in passing. In crossing the mountain through which this tunnel is pierced, a violent hailstorm was encountered. The tunnel (4½ miles in length) is now being driven from four faces. At the Dolan Station of the Central Wales Railway, the train was taken; and after passing through Llandrindod Wells, the through carriage was shunted on to the Mid-Wales Railway at Builth Road Junction, and taken by the Cambrian train up to Rhayader. Here the party embarked in an open truck, and proceeded down the Mid-Wales line, and then along the line made specially for the works, to the site of the dam of the Caban Coch reservoir, which is the lowest of the six dams to be ultimately constructed in the Elan and Claerwen Valleys for the storage of the water of these rivers, which down to the Caban have a total drainage area of 45,562 acres. The party were here joined by Mr. Yourdi, the Resident Engineer in charge of the watershed works. The excavation for the dam at the large Caban Coch reservoir has been completed on the Brecon side of the river; and the building of the foundation and the formation of the culvert on that side have been commenced.

On the arrival of the Committee at this point, the Lord Mayor invited Alderman Lawley Parker to lay a stone at the outlet end of the culvert, in order that his name might be permanently associated with the work at this stage. Mr. Mansergh asked to be allowed to present Alderman Parker with a mallet (a model of those used in the ordinary work) with which to lay the stone. He said it had been his lot during the past thirty years to meet a large number of public bodies, committees, and boards of directors; but he should like to be permitted to say that in no case had he worked under more pleasant or cordial relations than with the Elan Committee. This relationship he attributed to their mutual confidence and respect. He felt especially grateful to Alderman Parker because, while his duty to Birmingham was always paramount, he showed that this feeling was not inconsistent with his being sympathetic and helpful in his dealings with him (Mr. Mansergh) and those associated with him in the work. He asked Alderman Parker to accept of a mallet instead of the conventional trowel, as being the more appropriate to the particular work. The mallet, which was of ebony with silver mounting, and bore the city arms embossed, was inscribed as follows: "Birmingham Water-Works. Mallet used in laying a stone in the outlet end of the Brecon culvert of the Caban Coch reservoir dam by Lawley Parker, Esq., Chairman of the Elan Supply Committee, 8th October, 1896. James Mansergh, V.P.Inst.C.E., Engineer." Alderman Parker then laid the stone, and alluded feelingly to the kindness of his friends in arranging for the ceremonial entirely without his knowledge. He also acknowledged the assistance he received from the other members of the Committee, and from the officials associated with him in the work.

After this function had been performed, and the character of the work had been explained by the Engineer, the party were taken up to a small reservoir which has been constructed on the Nant-y-Gro at about 860 feet above Ordnance datum, for the supply of the Elan village and the works. The evening was devoted to committee work, in conference with the engineers, and the land agent for the Radnorshire section of the aqueduct.

On the following morning a start was made for the stoneyard, where a small army of men were dressing stone for the several dams; and then in the truck the Committee travelled up the railway to the site of the dam of the Craiggoch reservoir, which is the highest of the series on the River Elan; its top water-level being 1040 feet above sea-level. Here the excavation is being vigorously proceeded with on both sides of the valley; sidings and bridges having been constructed, and air-compressing plant installed for operating the drills. This work was inspected with great interest, and afterwards the similar work at Penygareg, which is a good deal more advanced. At the submerged dam at Carregddu, the building of the wall has been going on for about four months; and the Committee had the opportunity of seeing the work in progress. All these dams are being constructed of what may be called Cyclopean masonry, consisting of rough blocks of stone from one to six tons in weight, embedded in a matrix of rich Portland cement concrete, forming, when finished, practically a monolithic mass. Much satisfaction was expressed at the substantial advance made with all the works since the last visit of the Committee.

The next morning, the Committee inspected the Caethon syphon, the Wye conduit, and the crossing of the River Wye, which form part of the contract let in the early summer of the present year to Messrs. John Aird and Sons. The contractors have made a connection with the Corporation railway just below its junction with the Mid-Wales line, and thus obtain access to their depôt, which occupies part of a spoil site acquired by the Corporation, from which they have already commenced to construct a temporary railway along the line of their work. Their contract extends from the Caethon syphon to the commencement of Messrs. Morrison and Mason's length at Dolan (a distance of about thirteen miles), where they will also obtain a connection with the London and North-Western Railway. The Committee were gratified to observe the energetic manner in which these works had been commenced. They were met upon the ground by Mr. Basil Ellis (a member of the firm), by Mr. Beale (their chief agent), and by Mr. Legg (who is the Resident Engineer in charge on behalf of the Corporation). Mr. Legg, like Mr. Brightmore, has previously been in responsible charge of important works for Liverpool and Manchester.

THIRLMERE WATER FOR WIGAN.

Not without cause, Alderman Richards, the Chairman of the Water Committee of the Wigan Town Council, spoke, at the last meeting of this body, in condemnatory language of the present water supply of the borough, which, it seems, has caused the Committee considerable anxiety for some time past, both in regard to its quantity and quality. The recent heavy rains have given them relief; but, remembering the past, the Committee have determined to secure a much larger supply than they now possess. Their deliberations on the subject have ended in an agreement with the Manchester Corporation, by which they will draw a supply of 200,000 gallons of water daily from Thirlmere; but they intend to take the precaution of laying a 12-inch main, so that, should anything happen to the existing supply, it will be possible to receive 1,500,000 gallons in 24 hours.

Alderman Richards, in moving the adoption of the minutes of the Committee, said they had come to the conclusion that Thirlmere was the source to which the inhabitants of Wigan would in future have to look for their supply of water; and they would do so with every confidence. The Thirlmere water was remarkably pure; and this in itself was a powerful reason why they should take it, for their own water was not of the description they would like it to be. In fact, he believed the time would come when the present works would have to be abandoned, because they were bound to admit that the source was not only polluted, but that the pollution was only likely to increase as time went on. If the condition of the gathering-ground altered at all, it would alter for the worse; and indeed it was only with the greatest care and attention that they were able to keep the water up to its present standard. He could not help reminding the members that, when the Water Committee and the members of the Council visited the water-works at his request, they found there were only twelve days' supply in the reservoirs. Unless rain had come speedily, he did not know what would have been done had the water fallen to such a depth that filtration would have been impossible. What the result would have been, he trembled to think. As to the proposed supply from the Manchester Corporation, it ought not to be a question as to whether it would pay or not. A good supply of water was the first and most vital necessity; and he believed it was possible to make the scheme pay.

Mr. Gaskell seconded the motion.

Alderman Ackerley inquired if the Chairman of the Committee could give any information as to how soon the water would be supplied.

Alderman Richards replied that, if they did not succeed in making arrangements with the owners of land and property through which the pipes would pass, the powers could not be obtained until the next session of Parliament or the one following. If, however, they were successful in making amicable arrangements with owners, they might be able to get through by Provisional Order.

Alderman Ackerley then congratulated the Water Committee on the excellent arrangements they had made. The terms of the Manchester Corporation were decidedly advantageous; and the water was admitted to be one of the finest supplied to any community in England.

Alderman Richards stated that they would take the water at 8d. per 1000 gallons, which was not a great price considering that Manchester had spent three millions of money to obtain 10 million gallons of water per day. When the next line of pipes was laid to carry another 10 million gallons to Manchester, the price would be 5⅓d. or 5d. When the third pipe was laid, it would be 3⅓d.; then 3$\frac{1}{10}$d.; and when the last pipe was laid—which probably none of them would ever see—it would come down to 2d. or 3d. The great advantage was that they would have a descending scale in prices.

Mr. Fyans and Mr. M'Quaid spoke adversely to the scheme.

On the motion being put, however, it was carried.

Alderman Richards then formally moved a resolution authorizing the Water Committee (among other things) to enter into a conditional agreement with the Manchester Corporation for the supply of water; to make terms and enter into agreements with various road authorities, owners, &c.; and to apply for the consent of the Local Government Board to the proposed additional supply.

Mr. Prescott seconded the motion, which was unanimously carried.

THE CONGRESS OF THE SANITARY INSTITUTE.

Sanitary Engineering and Water Supply.

In previous issues of the 'Journal," we have noticed portions of the proceedings at the recent congress of the Sanitary Institute at Newcastle. We give to-day some extracts from the address of Sir A. Noble, K.C.B., the President of the section devoted to Engineering and Architecture, who dealt with the subject of sanitary engineering and its bearing upon water supply; also some papers on the latter subject.

Sir A. Noble began his address by saying he thought the inception of sanitary engineering might be fairly attributed to the passing of the Towns Improvement Act of 1847 and the Public Health Act of the following year, for before that time no serious attention had been given to sanitation. Everything that was effected in that direction was done by rule of thumb; and, if sanitary improvements were made at all, it was only in special instances, where abominable smells or virulent outbreaks of disease forced the hands of those in authority. Commissions appointed after the passing of the Acts in question, to inquire into the causes of the terribly high death-rates which then ruled, found that everything was wrong. The drainage of private houses was altogether defective; there was, as a rule, no public water supply, and the wells from which most houses drew their water were contaminated; and there was no comprehensive scheme of town drainage. But even after the awakening, progress was at first very slow, because everything had to be done *ab initio*. Looking back from the standpoint of existing knowledge, we were surprised that so many of the early schemes of drainage and water supply should have proved as successful as they

did. But among the successes there was a large percentage of failures—some of them gigantic failures, involving the waste of very large sums of money. Such unfortunate enterprises were, of course, discouraging; and, in spite of the stimulus to sanitary reform given by the great outbreaks of cholera in 1849 and 1859, comparatively little was done in the first years that followed the passing of the two Acts. In 1866 came a slighter visitation of cholera; and from that date he thought it might be said that sanitary progress doubled its pace. It was the last quarter of a century that had witnessed those improvements and sweeping sanitary reforms that had placed England so far in advance of any other country as regarded hygienic matters.

Passing on to consider some of the problems which presented themselves to the sanitary engineer, Sir A. Noble remarked that there were none more urgent than those connected with the supply of water to large towns. Apart from drinking purposes, personal cleanliness and healthy dwellings were impossible without water, because experience had shown that a water-borne system of sewage disposal was the only one admissible for town use. It was, no doubt, attended with grave disadvantages; but it must prevail for many years to come, and prospective provision of water must be based upon that supposition. The fixed bath in houses, the common use of water-closets, the more perfect flushing of sewers, the more frequent watering of roads, and the more general employment of hydraulic machinery all meant more water. With this increased demand for water, as far as the town in which the Institute were meeting was concerned, the Newcastle and Gateshead Water Company had done their best to cope. Sir A. Noble then traced the history of the water supply of Newcastle from 1697, when an Oxfordshire man named Yarnold came forward with an offer to the Corporation to "convey good and wholesome water to all parts of the town, where required, in sufficient quantity for the uses and occasions of the inhabitants," in return for a lease securing him the monopoly of the supply—an offer which was gratefully accepted. Yarnold later on disposed of the works to a syndicate, afterwards formed into a joint-stock company, who kept up the service—not without some grumbling on the part of the consumers—till the eighteenth century was well advanced. In 1776, however, one Ralph Lodge, with some co-partners, in an address presented to the Corporation, referred to the inadequacy of the supply, and offered to furnish water to "every inhabitant upon all occasions and emergencies in the most ample manner." This offer was contingent on the city authorities granting him a lease of some of their springs. After some consideration, Lodge and his partners were granted a 227 years' lease of a piece of ground on which to make reservoirs to store the water of the Coxlodge spring, which had supplied Yarnold's pipes. In 1797, Lodge's works were purchased by the Newcastle Fire Office; and in 1805 a shaft was sunk by them, in the hope of obtaining additional water. This hope was more than realized. An immense body of water was tapped in some old pit workings, and it became the recognized supply for Newcastle. So effective were the measures taken by the Fire Office Company in 1805, that the water supply then obtained needed no supplementing for a quarter of a century. But in the autumn of 1831, Asiatic cholera visited Sunderland; and in the summer of next year it appeared in Newcastle. Personal cleanliness and frequent watering of the streets were preached as preventives. There was a panic; and the reservoirs of the Company were severely taxed. The water supply broke down. An opportunity was thus afforded for competition; and in 1833, a new undertaking, called the Subscription Water Company, came upon the scene. The Company's works were completed, and came into operation in November, 1835. So Newcastle had for the first time two Water Companies. This state of affairs was, however, of short duration, for in 1836 the older Company gave way, and sold all their works to the Subscription Company for £16,000. In 1801, the population of Newcastle was 28,000; in 1821 it had increased to 35,000; and in 1841 it was 70,000. The Subscription Company seemed to have done a good deal to keep pace with the growth of the population. But they hardly grasped the situation; and in the beginning of 1845, a very formidable rival threatened them. This was a Company formed to supply Newcastle with water from a reservoir in Whittle Dene, about 13 miles from Newcastle, where the water of the Whittle Burn was collected by damming. The formation of this Company was due to Lord Armstrong, who not only suggested the works, but in the early years of the concern gave it his powerful support. As the Fire Office Company had given way to the Subscription Company, so the Subscription Company in their turn gave way, and sold their undertaking to the Whittle Dene Company for £35,000. This last organization finished their works in 1848. Five large reservoirs were formed in Whittle Dene, having a capacity of 215 million gallons; and Newcastle was supplied from them by a 24-inch pipe. This was the first really comprehensive scheme; and it would be useless to trace in any detail the development of the water supply further from that time to the present. It was merely the history of occasional failures of water, and consequent grumbling; of an earnest endeavour on the part of the Company to keep pace with the extraordinary growth of the town by adding reservoir to reservoir; and of the gradual elimination of Tyne water from the Company's system, except for manufacturing purposes. In 1848, the reservoirs contained 215 million gallons; and the daily water consumption was 1½ millions. In 1857, the storage capacity had increased to 525 million gallons; and the consumption, to 3¼ million gallons per day. In 1876, the daily consumption reached 8¼ million gallons. Recently the consumption had risen at the rate of 500,000 gallons a day each year, until it was now about 16 millions. The population supplied by the Company was 400,000; and the present storage capacity was 3065 million gallons. Large as the Company's reservoirs were, they had proved insufficient, and an additional reservoir was in process of construction on the Rede, which would bring the storage capacity to upwards of 5000 million gallons.

Dealing, in his concluding remarks, with the advance of sanitary engineering in connection with the drainage of houses, Sir A. Noble said it was shown in the fact that the cry of "Something wrong with the drains" was now heard much less frequently than formerly; and an outsider like himself could not fail to be struck with the evidences of anxious attention and clever design exhibited in those commonplace but very necessary appliances. Though the details of sanitary improvements seemed often petty, they should not therefore be considered unworthy even of master minds. The general result was as vast and far-reaching as the details out of which it was built up were trivial and unromantic. It was the fashion among school men to divide knowledge into two classes—human and Divine. To them, all knowledge was Divine; and never more so than when it was busied with the efforts to lessen, however slightly, the sum of human misery, or to increase, however slightly, the sum of human happiness.

The Examination and Filtration of Water.

In the section devoted to Chemistry, Meteorology, and Geology, Dr. PERCY F. FRANKLAND, F.R.S., Professor of Chemistry in Mason College, Birmingham, read the following paper on "The Bacterial Examination of Water and Sand Filtration":—

One of the most important sanitary applications which has been made of gelatine-plate cultures is undoubtedly the examination of drinking water; and I think that, without exaggeration, it may be said to be now practised in every quarter of the globe. In the general rush after bacteria which followed the opening up of this new domain of work, it was inevitable that some rash assumptions should be made and unjustifiable anticipations entertained. It was not uncommon, for example, to hear the chemical analysis of water decried; while the bacteriological examination was declared to be capable of furnishing an answer to every question in which health considerations were concerned. We hear of water samples purposely inoculated with typhoid germs pronounced by the chemical expert as pure, while the bacteriologist by his methods was able to detect the typhoid bacillus and condemn them in consequence. Such evidence, if accepted without further consideration, might very easily mislead the public, not only as to the relative, but also the actual value to be placed upon the chemical and bacterial examinations of water respectively. In the above "test" of the merits of the chemical and bacterial inquiry, it must be remembered that such a sample of water purposely infected with a pure culture of typhoid germs could certainly not be found in practice; and that the conditions under which it was prepared, while eliminating all the materials upon the presence of which a chemical opinion could be formed—such as sewage contamination—presented the bacteriologist with all he could desire for the easy diagnosis of a typhoid-infected water. The supposed antagonism between the chemical and bacterial methods of water examination is entirely due to a misconception as to the separate functions which each method is capable of discharging. The bacterial examination of water enables us to attack and solve problems on which the purely chemical expert can throw no light. On the other hand, the chemist can teach us what the bacteriologist cannot. The two methods do not supplant, but rather supplement each other.

Perhaps the most important service which water bacteriology has conferred upon sanitary science is the insight which by its means we have obtained for the first time into the hygienic value attaching to various purification processes—notably the time-honoured practice, now more than half a century old, of sand filtration. What is now an old story, and recognized all over the world, was a novelty when in 1885 I published the first numerical results obtained in the examination, by means of Koch's gelatine-plate cultures, of the London waters before and after filtration. The results which I had obtained were quickly followed by the publication in Germany, in the following year, of similar investigations which had been simultaneously carried out at the Berlin Water-Works. The results of these bacteriological examinations were wholly unexpected, for chemical analysis had led but very little favour to be bestowed upon this process of sand filtration from a hygienic point of view; for, chemically, the water before and after passing through sand filters undergoes comparatively little alteration. Such slight chemical improvement as is shown, indicating that sand filtration had comparatively little effect on the dissolved matters in water, led to *a priori* speculation that it would be unlikely to remove bacteria and other minute forms of life. What such filtration, however, when efficiently carried out, accomplishes in respect to the bacterial character of water is now familiar to all, and may be represented, as is well known, by a reduction of as much as 99 per cent. of the microbes originally present. That such minute microscopic particles of life could be removed by, or find an obstacle to their progress through, the filter by such relatively large objects as grains of sand, not unnaturally gave rise to much speculation; and numerous inquiries into the mechanism whereby this remarkable result was achieved rapidly followed one another. Thanks to investigations of the most varied character, we are at present fairly conversant with the conditions upon which efficient filtration depends; and although there is still some difference of opinion as to the precise value attaching to individual factors, yet there can be no doubt that the water engineer is now in a position to regulate the working of his filters on sound scientific principles instead of being dependent upon the rule-of-thumb methods which so long were his only guide.

In connection with the influence of frost on the efficiency of sand filtration, I may mention that, in the monthly bacteriological examinations which I formerly made of the London waters for the Local Government Board, I repeatedly showed that it is during the winter months that the largest number of bacteria appear both in the unfiltered and filtered waters of the Thames and Lea. It is obvious that this connection between frost and sand filtration is a matter of the very highest importance in connection with the safety of towns supplied with filtered surface water, and one which has hitherto received inadequate attention. It is not sufficient, as some would lead the public to believe, to rush a polluted surface water through a few inches of filter-bed, however clumsily constructed, in order to obtain without further trouble or expense a filtrate which is as safe as the water derived from the profoundest borehole or most deep-seated spring.

In conclusion, I would add that, while the services of water bacteriology to sanitary science have thus been of the very highest value, much still remains to be done in obtaining public and official recognition in our country for this now well-established method of inquiry. We have only to glance at the regulations issued by the German Government in respect of the filtration of surface water—regulations which have been based and built up on the evidence

furnished by bacteriological investigations—in order to realize how far behind we still are in officially recognizing the important services which water bacteriology can render to the community.

Village Water Supplies.

In the same section, the following paper on the above subject was read by Dr. J. C. THRESH, the Medical Officer of Health to the Essex County Council:—

During the last half century, so much attention has been given to the provision of public supplies of potable water, that nearly every town in the United Kingdom has obtained such a supply of a more or less satisfactory character. But our rural districts and the great majority of our villages still derive water from more or less objectionable sources; and the supplies, besides being liable to contamination, are often very deficient in quantity, and not readily available. The result is that personal cleanliness is too frequently neglected, and the houses and surroundings are generally uncleanly. Medical officers of health in charge of rural districts are continually complaining of these insufficient supplies, and almost daily recording outbreaks or extensions of decease attributable, directly or indirectly, to the lack of an abundant supply of wholesome water. The local authorities are authorized by Parliament to carry out all works necessary for providing sufficient water; and one of the express duties charged upon them by the Public Health (Water) Act, 1878, is that of seeing that every house has within a reasonable distance an available supply of wholesome water, sufficient for all domestic requirements. This duty has been greatly neglected, because public supplies of water cannot be obtained without expense; and too many members of such authorities regard the keeping down of the rates as being their chief duty, if not the one and only duty which they owe to the ratepayers who elect them. These gentlemen have no conception of the advantages of a public supply of pure water, and have exaggerated ideas with reference to the difficulties and expense. Engineers and hydrologists, busy with large schemes, have not given this subject the attention it deserves; and I know that the dread of incurring heavy initial expenses in consulting experts has prevented many works of village supply being executed.

I am decidedly of opinion that every village, however small, should have a public supply, for the abundance and purity of which the local authority should be responsible. If a scheme for conveying the water by mains to the houses is for any reason not feasible, public wells may be sunk in the most convenient situations, or springs properly protected and rendered easily available. In probably a great majority of villages, however, a public supply of wholesome water could be obtained, and conducted by mains to most of the houses, at a cost comparatively reasonable. The amount of water required for village supplies is much less per head than in towns, especially when the water is drawn from stand-pipes only, and not laid on to the houses. Moreover, little or no water is required for municipal purposes (sewer flushing, &c.); hence a supply of from 10 to 15 gallons per head per diem is, in very many cases, much more than will be used. The more urban in character the village, the larger the supply required; but with well-laid mains, 20 gallons per head daily ought in every case to be abundant. The approximate amount needed being known, some source capable of yielding this as a minimum has to be discovered. We may resort to springs, go to the subsoil, or penetrate more deeply into the earth with the view of tapping a subterranean source of water. If there be a sufficiently large stream of unpolluted water, it may be possible to derive a supply therefrom, provided the quantity of water abstracted does not affect the riparian owners, or the rights of others lower down the stream. So few streams, however, are safe from pollution, that it is always better, if possible, to go to the fountain head and tap the springs—the feeders of the stream. There are large numbers of springs throughout the country waiting to be utilized. Where a spring rises at a sufficient elevation to supply the village by gravitation, and is within a reasonable distance, a more economical source can rarely be found. If the spring is of sufficient volume, and the requisite few feet of fall can be obtained, yet is too low to supply the district by gravitation, probably an inexpensive hydraulic ram turbine or water-wheel can be used. This, without any expenditure for labour or supervision, may throw a sufficient quantity of water into a tank at an adequate elevation, from which the village may be easily supplied.

On account of the disrepute into which shallow wells have fallen, owing to their faulty construction and their general insanitary surroundings, the subsoil as a source of water supply is being neglected. Yet, in very many localities, there are immense stores of water there which can be utilized. If a suitable site be selected, and proper precautions taken, very pure water can be obtained from this source. It will almost invariably require pumping; but this may be cheaply effected by the aid of a windmill, a hot-air engine, or an oil or gas engine. I could give several examples of such village supplies. I have lately been engaged in finding a supply of water for a village of about 1000 inhabitants. A very eminent engineer who had been consulted reported that the only hope of obtaining a supply of water was by sinking a deep well, and he estimated the cost at £6000; but as he expressed a doubt as to whether sufficient water was obtainable from such a well, he did not recommend the parish to carry out his scheme. I found that there was, close by, a large area of sand and gravel covered with brick earth; the whole being about 19 feet thick, and containing 9 feet of water. The experiments I have carried out prove that 30,000 gallons of water per day can easily be obtained within a quarter of a mile of the village; and I estimate that the total cost of supplying the parish therefrom will be less than £2000. In a parish having a population of 2500 in one of my districts, the water is pumped from a similar source; and a 1s. rate levied on the consumers only, defrays the whole annual expense.

The money required to carry out a village water supply may, with the consent of the Local Government Board, be borrowed, and be repaid by thirty annual instalments of principal and interest. The annual cost, therefore, will be this instalment *plus* any expenditure entailed by pumping and keeping the works in repair. There is no uniform procedure for raising this annual sum. In certain districts, the whole is levied upon the houses supplied with water; in others, a charge is made on the general sanitary rate for the water used for flushing sewers, road watering, &c.; while in others, the special water-rate only covers the cost of maintenance and pumping (if any)—the cost of the works being borne by the whole parish. This would seem to be the fairest way, since the works ultimately become the property of the entire parish, and not merely of those who use the water. In many districts, landowners and property owners who would be specially benefited by a public supply have contributed liberally towards the expense—thus lightening the burden upon the parish; and the Limited Owners Reservoirs and Water Supply Further Facilities Act, 1877, enables a landowner to charge his estate with the cost of constructing works for the supply of water thereto, or enter into an agreement with the local authority for a supply of water, the cost being an improvement charge upon the estate.

The difficulties in the way of supplying villages and rural districts have been greatly over-rated, and probably only in few cases are they insurmountable. In recommending a really good scheme, one can always feel the utmost confidence in asserting that, however much it may be opposed by those intended to be benefited (and local opposition always arises when a sanitary authority proposes to provide water-works), the works will not have been in existence long before the benefit conferred will be gratefully acknowledged.

In the course of the remarks to which the paper gave rise, Mr. G. J. Symons, F.R.S., said there was no doubt that the distinguished members of the engineering profession were too much occupied to attend to small matters; and he ventured to think, under the circumstances, that a good chance was thus offered for profitable employment for some young engineer who would throw himself heart and soul into the breach. Mr. J. E. Parker said Dr. Thresh had estimated the water required for a village supply not to exceed 10 to 15 gallons per head daily; and he could quite confirm that view. In Lanchester, the district with which he was connected, the water supply registered was only 6 to 7 gallons per head per day. Mr. Watson said an ordinary water scheme for a village very often brought up the cost to a rate of something like 1s., and in some cases 2s. in the pound. One reason for this was the high rate which local authorities had to pay the Government for the money they borrowed. At present they could not obtain money under something like 3½ per cent. This was excessive, because they were all aware that the Government could get it for 2¾ per cent. As the security of the ordinary local authority was thoroughly good, he did not see why the Government should not stretch a point in this regard. In Scotland, each village must provide its own scheme, under a bond for repayment. He suggested that it would be better for the county to borrow money for water-works within the county, just in the same way as a city and town did.

The Incandescent Gas System for Public Lighting.—The Tottenham District Council have resolved to adopt the incandescent gas system for lighting the public streets. The alteration of each lamp is to be at the rate of 14s.; and the yearly cost of maintaining each single burner lamp, £3 0s. 9d. per annum—this being an increase of 9d. per lamp.

The Proposed Purchase of the Ashford Gas-Works by the District Council.—At a meeting of the Ashford District Council last Thursday, the Clerk stated that he had received certain documents relating to the Council's resolution to promote in Parliament the Ashford Gas Bill, and approving of it. The Bill will have for its object the acquisition by the Council of the undertaking of the Ashford Gas Company, and the carrying on thereof. The Directors of the Company have served the Council with a writ to restrain them proceeding further with the proposed Bill, in consequence of alleged non-compliance with the Act of Parliament governing the procedure of public bodies in these matters; and the Council have given instructions for the necessary steps to be taken to defend the action.

The London County Council and the Water Question.—At the meeting of the London County Council last Tuesday, Mr. Antrobus brought forward the following motion, which had been for some time upon the *agenda*: "That it be referred to the Water Committee to prepare and present to the Council a report showing generally the terms of purchase of water undertakings by provincial authorities, and, where such have been laid down by Parliament, whether the basis for arbitration has been that of the Lands Clauses Act or otherwise; and if otherwise, what has been the basis." He said he thought the information asked for by the resolution was necessary before any settlement of the question of the water supply of London could be arrived at. Mr. Westacott seconded the motion, which was accepted by the Chairman of the Water Committee (Mr. W. H. Dickinson), and agreed to without discussion.

Installation of West's Stoking Machinery at Walsall.—Last Thursday, the Gas Committee of the Walsall Town Council visited the gas-works at the Pleck, for the purpose of inspecting the work that has been lately carried out in the retort-house. The Committee viewed the new retort-stack, consisting of ten beds, each containing eight retorts heated on the regenerative principle; the settings being arranged according to the designs of the Engineer and Manager (Mr. J. Tindall). At present there are only five of these beds at work, and they are drawn and charged by West's manual stoking machinery, which the Chairman of the Committee (Mr. T. P. Brownhill) formally started by personally drawing and charging a retort by the aid of the machinery, which has been erected under the supervision of Mr. F. Sykes, of West's Gas Improvement Company, Limited. The Committee made a close examination of the machinery, and expressed their satisfaction with it; and it was generally considered that not only would it save a large amount of arduous manual labour, but, by the more equal distribution of the coal over the surface of the retort ensure more perfect combustion, and a correspondingly larger yield of gas from the coal carbonized. At the conclusion of the proceedings, the Chairman invited the members of the Committee to partake of light refreshments. His health was proposed by Alderman Newman, who referred in flattering terms to the valuable services rendered by Mr. Brownhill to the town since his appointment as Chairman of the Gas Committee.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The removal by death of Mr. John M'Crae, the Manager of the Dundee Corporation Gas-Works, came with startling suddenness upon his brother gas managers. It is difficult to write much about Mr. M'Crae, because everybody knew him, and knew at once what he was. He was exceedingly plain, blunt, and straightforward. It may be that he was, for his own sake, a little too much so; for his remarks occasionally went so far home that they were apt to produce what can only be described as a species of rankling in the bosoms of some of his auditors. This quality may unhesitatingly be put down to mere mannerism, and not to temper or intention; for no more glowing or cheerful companion, or more sympathetic friend need be wished for by anyone. He was the soul of good company. Certainly the cares of life sat lightly upon him. This, combined with his undoubted talents in his profession, made him a conspicuous figure wherever he went, and a general favourite as well. A striking tribute was paid to him at a meeting of gas managers at which I was once present. The speaker said that in any part of England, whenever Mr. M'Crae came into a company of gas managers, the remark was at once made: "Here's M'Crae." It was unnecessary to specify who he was or where he was from, because everybody knew that. Of his work it must be said that it was of a high-class order, and most thoroughly done. A walk through the Dundee Gas-Works was always a treat, as everything was always in order. Another characteristic feature of Mr. M'Crae was that he manifestly lived above his occupation. His spirit, his tastes, his acquirements, were by no means confined within the walls of the gas-works. He was broad-minded; and on almost any subject he was an intellectual force. The sudden extinction of so bright and promising a life, is a distinct loss to the gas profession.

The hearing of the evidence in the Dunfermline gas arbitration was concluded on Wednesday afternoon; and the hearing was adjuorned till a date later on in the month, for the speeches of Counsel. By that time the proof will be revised and printed, which should be of great benefit to the Court. The proceedings were throughout of a most deliberate sort. If an award satisfactory to both parties is not given, it will not be on account of want of time to arrive at it. So slow, indeed, was the progress, that it was at one time under consideration whether some of the witnesses should not be heard in London. This course, however, it was not found necessary to resort to. Surmises are rife as to what the award will be, and I have, of course, my own figure; but it is inadvisable to give the opinions held, until the award comes out.

An action has been brought in the Court of Session at Edinburgh by the Incandescent Gas-Light Company, Limited, of London, against Paul M. Stork, carrying on business in Edinburgh under the name of the Excelsior Light Company. The pursuers conclude for interdict against the defender infringing the Welsbach patents, for £500 as damages, and for an order to deliver up all the apparatus of which he might be in possession or have supplied within the United Kingdom, which they complain of as infringements. The defender says he was agent for the Gas-Glühlicht Gautzch, of Berlin, by whom he was assured that the mantles they supplied were not an infringement of the pursuers' patent rights; but that about May 7 last, as a result of the action raised by the pursuers against the De Mare Gas-Light Company, and before the raising of the present action, he ceased to sell the mantles, and returned all those then in his possession to the Company at Berlin. Since that time he has sold none; and he had no intention of again dealing in them. He sold altogether 422 mantles, which he purchased for £18 13s. 6d., and the profit upon which amounted to £5 11s. 3d. He admits the infringement, and tenders £10.

As mentioned last week, the Sub-Committee on Finance of the Glasgow Corporation had before them recently an application on behalf of Mrs. Connor, who, with her daughter, was injured, and whose two sons died from gas poisoning through an escape from a fractured pipe leading into the house occupied by them in Moncur Street, Calton; and the Sub-Committee agreed to recommend that the Corporation should give Mrs. Connor a donation of £120. The smallness of the amount seemed to impress some people. At a meeting of the Town Council on Thursday, Mr. Richmond, with the remark that he did not wish to discuss the matter, but that he thought the Committee had come to their decision without a full knowledge of the circumstances, moved that the subject be sent back for re-consideration. Lord Provost Bell, on a question being asked, explained that if, on the matter again coming before the Council, they decided that a more generous grant would be advisable, they would not in any way be bound to the £120. The subject was sent back accordingly. Not knowing the circumstances, it is difficult to say anything in a matter of this kind. It is not to be forgotten that the grant was to be made without admitting liability; but, reasoning from the analogy of what a jury would be likely to do were liability established, I should say that £120 for the loss of two sons is inadequate. I daresay the offer is made in the hope that, if it is accepted, they will avoid the establishment of a precedent. If this be so, there is the more need to be generous, in order to take away the opportunity of the pettifogging lawyer. If the Corporation are satisfied that there is no liability attaching to them, why give anything out of the funds of the gas department? Even if something is to be granted, it would be better policy to give it as a donation from the magistrates out of the Common Good or some other fund at their disposal, than to take it out of any fund derived from the citizens, by assessment or otherwise, as by that means any precedent established, —and no matter how it may be hedged round, every such payment does make a precedent—would be against the magistrates, in their magisterial capacity, or fathers of the people, and not against the community.

The Kilsyth Police Commissioners have advanced the wages of their Gas Manager by 2s. per week. This may be looked upon, I suppose, as a reward for good work done recently. It was reported to a meeting of the Commissioners on Monday, that since the new regenerative settings of retorts had been working, the yield of gas per ton of coal had risen from between 7000 and 9000 to 10,500 cubic feet; while the illuminating power was the same as before. The speaker considered that the Gas Committee and the Manager were entitled to some little credit for the efficient manner in which the works had been wrought during the past year. Of course they are. If he is a benefactor who makes two blades of grass grow where one grew before, the man who can take more gas out of a lump of coal than was previously possible, is equally so.

The new gas-works of the Rothesay Corporation are all but completed; and an opening ceremony in connection with them is to be held on Friday, the 30th inst., to be followed by a luncheon.

The Corporation of Edinburgh having acquired the undertaking of the Portobello Gas Company, are to enter into possession of them at mid-day on the 11th of November—being Martinmas term day. The Corporation are about to promote a Bill in Parliament for various purposes, one of which is to authorize them to hand over the management of the Portobello works, under agreement, to the Edinburgh and Leith Gas Commissioners. Without statutory authority, it would be impossible for the Gas Commissioners to assume the management of the undertaking; and the thought arises whether the Gas Commissioners should not be made parties to the Bill. The Town Council cannot procure powers for the Gas Commissioners. They are to work the Portobello undertaking under the Burghs Gas Supply Act, which authorizes them to appoint a Committee "of their own number" to manage it; and therefore it is doubtful whether, unless this Act be repealed so far as Edinburgh is concerned, any new statute could give the Corporation power to hand over the undertaking to the Gas Commission. But even if this difficulty were overcome, and the Corporation were to be empowered to hand over the management of the undertaking to the Gas Commission, the Gas Commission would still have no statutory authority in Portobello. They might undertake the management so far as buying and selling, manufacture and distribution of gas, the laying and repairing of mains, the repair, renewal, or extension of the works, and the appointment of the Manager and other workers was concerned. But their Treasurer could not be the Treasurer of the Portobello undertaking, and they would have no power to sue, nor liability to be sued, in respect of it, for the simple reason that they had no statute, but were simply in the position of lessees. This difficulty would be removed if the Gas Commissioners were made joint promoters of the Bill.

Mr. A. Smith, of Aberdeen, has been engaged recently in making a valuation of the works and plant of the Montrose Gas Company. It is some time since a valuation was made; and this is simply, in the meantime, a re-valuation for the purposes of the Company.

The Kirkintilloch Police Commissioners have reduced the price of gas from 3s. 9d. to 3s. 6d. per 1000 cubic feet. There was a surplus of £600 upon the working of the undertaking last year; and the Commissioners possess a depreciation fund amounting to £3000. The Commissioners are about to take steps to promote the further use of gas heating and cooking appliances in the town.

The negotiations for the transfer of the undertaking of the Stirling Gas Company to the Corporation are at present at a standstill. The minute of the Gas-Works Committee which was read at a meeting of the Police Commissioners on Monday was to the effect that Mr. M'Gilchrist, of Dumbarton, who is the technical adviser of the Commissioners, had attended one of the Committee meetings, and was requested to continue his investigations and to complete his report as early as possible; and that Mr. M'Gilchrist stated that he would do so, but that some little delay had arisen through the illness of Mr. Watson, the Manager of the works. It was further reported that Mr. M'Gilchrist did not at present think it would be necessary to procure the services of an accountant in connection with his report; but that if he should find it desirable, he would inform the Committee.

Very satisfactory results continue to be obtained in the working of the Perth Corporation Gas-Works. During the past month, there was an increase of more than a million cubic feet of gas produced, as compared with the corresponding month of last year. Since May 1, the total output of gas has amounted to 28,347,600 cubic feet—an increase of 3,132,200 cubic feet over the output in the corresponding period of last year. The increase is at the rate of 12·42 per cent. of the gas made, and 12·92 per cent. of gas delivered.

At the last meeting of the Dumbarton Town Council, the Gas Committee in their report for the past year stated that the arrears of gas-rental were absolutely *nil*, and they recommended that the price of gas to ordinary consumers should remain at 3s. per 1000 cubic feet, being that of the past year, with no charge for meter hire, and that the price to the Police Commissioners for public lighting be continued at the present rate of 2s. 5d. per 1000 cubic feet. Provost Garvie remarked that the report was a very satisfactory one indeed. The consumption of gas had increased fully 10 per cent. during the year, and, as Mr. James M'Gilchrist, the Corporation Gas Engineer, had said, the electric light could never have any footing in Dumbarton, because it could not compete against gas with the price at 3s. The adoption of the report was unanimously agreed to. While addressing his ward constituents the other night, Provost Garvie further said that the revenue from the gas undertaking during the past year amounted to £8561; and that while there was such a large sum to collect, the arrears at the end of the financial year were *nil*. He also remarked that the profit for the year amounted to £850, of which sum he had asked Mr. M'Gilchrist to pay £400 into the Common Good, which was a very useful place to put it into.

The make of gas by the Falkirk Gas Commissioners in the twelve months ending May 15 last was 78,091,000 cubic feet, compared with 65,961,600 cubic feet in the preceding year—an increase of 12,129,400 cubic feet, or at the rate of 18 per cent. From the date first named, the make has been about 19 million cubic feet, against 16 millions in the corresponding period of 1895—an increase at the rate of 18·35 per cent. Should this continue, new works will be required before long. The quantity of gas sold from May 15, 1895, to October 1, 1896, was 74,083,900 cubic feet. A reduction of 5d. per 1000 cubic feet on this amount of gas is a saving to the consumers of £1543; and at last May the Commissioners had a credit balance of upwards of £300 to carry forward. The number of consumers on Feb. 1, 1895, was 3188; on Oct. 1, 1896, 4200—an increase of 1012. Out of this number, about 400 use prepayment meters, some of which were only fixed in part of the past quarter. The amount collected from prepayment meters

during the summer survey amounted to upwards of £60 in coppers. The largest sum taken from one meter was £1 1s. 3d. in coppers. The Commissioners hope soon to do away with meter-rents.

The Directors of the Glenboig Union Fire-Clay Company, announce that, with an amount of £2242 brought forward from the previous year, they have a balance of profit on hand of £17,439, and that the net profit for the past year is, after writing off £5000 for depreciation, £12,439. They recommend payment of a dividend at the rate of 7½ per cent. for the year. The Directors state that the manufactures of the Company maintain their high reputation. The demand, both at home and abroad, for Glenboig bricks, indicates that, for the furnaces of iron and steel works and other industries where the highest heat is required, they are ever increasing in favour. An extension of the clayfield at Glenboig, and also at Gartcosh, has been effected during the past year. The resources of the Company, as regards the raw material, are practically inexhaustible.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Oct.* 17.

Sulphate of Ammonia.—Throughout the week, the market has been depressed, and there are no signs of improvement at present. The situation remains very much as last reported—that is to say, production increases; and, there being very little encouragement to hold, makers are marketing their production as it becomes available. This is rather more than finds a ready sale; for, although there is a fair demand, there is nothing exceptional about it, notwithstanding the low level of prices touched. Consequently, quotations are reduced to £7 2s. 6d. Leith, £7 5s. Hull, and £7 6s. 3d. Liverpool. The Scotch market still leads the way in the downward move; and the English makers have of necessity to fall into line. In the forward position, dealers are offering up to end of the year at about spot prices; and over the first three months of next year, at a premium of about 5s. per ton. Even at these prices, buyers show no eagerness to operate.

Nitrate of Soda is quiet at 7s. 10½d. per cwt. for fine quality on spot. In the forward position, values are unchanged.

LONDON, *Oct.* 17.

Tar Products.—This market is distinctly quiet all round. Benzols are at the moment flat; and both prompt and forward prices are quoted lower. Creosote and tar oils are somewhat stronger. The exportation of creosote is said to have assumed a very much larger figure than in former years. Both solvent and burning naphtha are in good request, but crude naphtha is easier. Anthracene is nominally quoted at Committee rates; but very little business is being done. There is no large quantity of anthracene held outside the Committee; and for what there is, full market rates are being asked. Pitch is only in moderate request; and buyers still hold off in the hope of lower prices. Carbolic acid is a little stronger; but cresylic acid and disinfecting qualities are cheaper, and evidently in over-production.

The following prices denote business transactions during the week: Tar, 18s. to 26s. Pitch, 28s. to 31s. Benzols, 90's, prompt, 4s. 6d; forward, 4s.; 50's, prompt, 3s. 3d.; forward, 2s. 10½d. Toluol, 2s. 3d. Solvent naphtha, 1s. 5d. Crude, 30 per cent., naphtha, 1s. 4½d. Creosote, 2d.; liquid, 2⅛d. Heavy oils, 4½s. Naphthalene, pressed, 60s.; salts, 32s. 6d. Cresylic acid, nominal, 9d. Carbolic acid, 60's, 1s. 9d. to 1s. 10d. Anthracene, "A," 10d.; "B," 8½d.

Sulphate of Ammonia continues sick and sorry, and makers are becoming alarmed at the continuous fall in prices, as well as what is perhaps of more importance, the real slackness of orders. Stocks in maker's hands are being greatly magnified by interested operators; and this is no doubt the baleful influence which is so severely depressing sulphate of ammonia at the present time. Sales have been made during the week at the following prices: Leith and Northern ports, £7 to £7 2s. 6d.; Hull and East Coast ports, £7 5s.; London and South Coast, £7 7s. 6d. to £7 10s.; Liverpool, £7 7s. 6d. In all instances, less 3½ per cent. discount.

Splendid Position of the Manchester Water Supply.—Referring to the importance of having an adequate and pure supply of water, Alderman Sir John Harwood informed the members of the City Council at their last meeting that if not a drop of water entered the reservoirs at Thirlmere and Woodhead for 147 days, the Committee could still supply during all that period 35 million gallons per day.

Additional Storage at the Oxford Gas-Works.—The Directors of the Oxford Gas Company found it necessary last year to increase the storage capacity of the works, and they decided, on the advice of their Engineer (Mr. J. Eldridge), to erect a new gasholder sufficiently large to enable them to provide for an increased output of gas, also to clear away some little old gasholders which occupy ground required for the rearrangement of the engines and boilers and the exhausting and washing plant. The tank is built of brindled Staffordshire bricks, of which more than one million have been used. The circular wall at the base is 4 ft. 6 in. thick, and at the top 2 feet, and is puddled at the back with the blue Oxford clay found on the site. The stones for the guides and for supporting the columns are of best Derbyshire grit. The internal diameter of the tank is 157 feet, the depth from the ground-line, 20 feet; above ground-line, 10 feet—giving a total of 30 feet. When filled, it will contain 3,338,000 gallons of water. The crown of the gasholder, which rises 7 feet, is supported when down by framework erected in the tank. The upper lift is 150 feet in diameter and 30 feet deep; and the second lift, 152 ft. 6 in. diameter and 30 feet deep. These give a storage capacity of a million cubic feet; and a third lift, of 500,000 cubic feet capacity, can be added at any future time. The guide-framing consists of 18 cast-iron columns 60 feet high with middle entablatures, and with the capitals arranged for the future increase in height to 90 feet. The columns are connected by one line of girders 3 feet deep, and one line 3 ft. 6 in. deep, and by tension-rods in every bay. With the exception of the columns and pipes, all the holder and the appliances are of steel. The weight of cast iron in the structure is 420 tons; and of steel, 341 tons. The Contractors for the tank were Messrs. Holme and King, of Liverpool; and for the gasholder, Messrs. Clayton, Son, and Co., of Leeds.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST (see ante, p. 736).

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
590,000	10	15 Oct.	10½	Alliance & Dublin 10 p. c.	22—24*	..	4 7 6
100,000	10	,,	7½	Do. 7 p. c.	17½—18½*	..	4 1 1
300,000	100	1 July	5	Australian (Sydney) 5% Deb.	108—110	..	4 10 11
200,000	10	12 June	5	Belgrano (B. Ayres), Limited	10¼—10⅝	..	4 13 1
100,000	Stck.	26 June	5	Do. 5 p. c. Deb. Stk	100—103	..	4 17 1
200,000	5	29 May	6½	Bombay, Limited	7⅝—8¼	..	3 18 9
40,000	5	,,	6½	Do. New, £4 paid	5⅜—6	..	4 6 8
380,000	Stck.	13 Aug.	12	Brentford Consolidated	285—290	..	4 2 9
210,000	,,	,,	9	Do. New	215—220	..	4 1 9
50,000	,,	,,	5	Do. 5 p. c. Pref.	140—145	..	3 9 0
159,375	,,	12 June	4	Do. 4 p. c. Deb. Stock.	130—134	..	2 19 9
220,000	Stck.	16 Sept.	11½	Brighton & Hove Original	242—247	..	4 13 1
208,820	,,	,,	8½	Do. A Ord. Stk.	185—190	..	4 9 5
933,500	Stck.	28 Aug.	5	Bristol, 5 p.c. max.	127—132	..	3 15 9
420,000	20	15 Oct.	11¼	British	56½—57½*	..	3 18 3
50,000	10	28 Aug.	11¼	Bromley, Ordinary 10 p. c.	22—23	..	5 0 0
71,000	10	,,	8½	Do. 7 p. c.	19—20	..	4 5 0
500,000	10	15 Oct.	6	Buenos Ayres (New) Limited	10¾—11*	..	5 9 1
200,000	100	1 July	6	Do. 6 p. c. Deb.	103—106	..	5 13 2
150,000	20	15 July	8½	Cagliari, Limited	29—31	..	5 6 5
100,000	10	30 Sept.	6	Cape Town & District, Ltd.	17—18	..	3 6 8
50,000	50	2 May	6	Do. 6 p. c. 1st Mort.	58—60	..	5 0 0
550,000	Stck.	15 Oct.	13½	Commercial Old Stock	343—348*	+1¾	3 17 5
165,000	,,	,,	10½	Do. New do.	255—260*	+1	4 0 9
165,000	,,	12 June	4½	Do. 4½ p. c. Deb. do.	152—157	..	2 17 3
800,000	Stck.	12 June	13	Continental Union, Limited.	285—290	..	4 9 8
200,000	,,	,,	10	Do. 7 p. c. Pref.	220—225	..	4 8 11
51,600	Stck.	28 Aug.	14	Croydon Com'cial A 10 p. c.,	315—320	..	4 7 6
163,400	,,	,,	11	Do. B 7 p. c.	250—255	..	4 6 3
535,000	Stck.	28 Aug.	5½	Crystal Palace Ord. 5 p.c. Stk	140—143	..	3 13 5
60,000	,,	,,	5	Do. 5 p. c. Pref.	140—145	..	3 9 0
486,090	10	15 July	11	European, Limited	26½—27½	+½	4 0 0
354,060	10	,,	11	Do. £7 10s. paid	18—19	..	4 6 11
5,746,590	Stck.	13 Aug	12¾	Gaslight & Coke, A, Ordinary	307—312	..	4 1 9
100,000	,,	,,	4	Do. B, 4 p. c. max.	110—115	..	3 9 7
665,000	,,	,,	10	Do. C, D, & E, 10 p. c. Pf.	305—315	..	3 3 6
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	147—152	..	3 5 9
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	212—217	..	3 9 1
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	207—212	..	3 6 0
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	305—315	..	3 3 6
476,000	,,	,,	6	Do. K, 6 p. c. Prf.	173—178	..	3 7 5
1,061,150	,,	12 June	4	Do. 4 p. c. Deb. Stk.	138—143	..	2 15 11
294,850	,,	,,	4½	Do. 4½ p. c. do.	153—158	..	2 16 11
908,000	,,	,,	6	Do. 6 p. c. do.	207—212	..	2 16 7
70,000	10	14 May	6	Hongkong & China, Limited	12—13	..	4 12 4

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
3,800,000	Stck.	14 May	12	Imperial Continental	247—252	−1	4 15 3
376,400	100	1 Aug.	4	Do. 4 p. c. Debs. Red.	100—103	..	3 17 8
473,600	Stck.	13 Aug.	3½	Do. 3½ p. c. Deb. Stk	108—110	..	3 3 8
75,000	5	26 June	6	Malta & Mediterranean, Ltd.	6—6½	..	4 12 4
560,000	100	1 Oct.	5	Met. of Melbourne, 5 p. c. Deb.	113—116	..	4 6 2
250,000	100	,,	4½	Do. 4½ p. c. Debs.	108—110	..	4 1 10
541,920	20	12 June	5	Monte Video, Limited	16½—17½	..	5 14 3
150,000	5	29 May	8	Oriental, Limited	8⅛—8⅜	..	4 11 5
135,000	5	,,	8	Do. New, £4 10s. paid	7⅞—7¾	..	4 12 10
15,000	5	,,	8	Do. do. 1879, £1 paid	1⅜—2	..	4 0 0
60,000	5	16 Sept.	7	Ottoman, Limited	5—5½	..	6 7 3
420,000	100	1 May	6	People's Gas } 1st Mtge. Bds.	105—110	..	5 9 1
500,000	100	1 June	6	of Chicago } 2nd Do.	102—107	..	5 12 1
250,000	10	30 Sept.	10	San Paulo, Limited	13½—14½	+½	6 18 0
5,475,000	Stck.	13 Aug.	5⅝	South Metrop., 4 p.c. Ord.	144—149	..	3 9 9
820,000	,,	15 July	5	Do. 5 p. c. Deb. Stk.	173—176	..	2 16 10
60,000	Stck.	16 Sept.	11½	Tottenham & Edmonton, A	265—275	..	4 3 7
60,900	,,	,,	8½	Do. B	180—190	..	4 9 5
170,380	10	29 May	10	Tuscan, Limited	13½—14½	..	6 18 0
149,900	10	1 July	5	Do. 5 p. c. Debs. Red.	100—102	..	4 18 0
				WATER COMPANIES.			
746,123	Stck.	26 June	10½	Chelsea, Ordinary	343—348	−2	2 18 11
150,000	,,	,,	5	Do. 5 p. c. Pref.	177—182	..	2 14 11
160,000	,,	,,	4½	Do. 4½ p. c. Pref. Stk., 1875	160—164	..	2 14 10
175,785	,,	30 Sept.	4½	Do. 4½ p. c. Deb. Stock	162—167	..	2 13 11
1,719,514	Stck.	15 Oct.	7	East London, Ordinary	222—227*	−2½	3 1 7
654,740	,,	26 June	4½	Do. 4½ p. c. Deb. Stk.	163—168	..	2 13 7
225,000	,,	,,	3	Do. 3 p. c. Deb. Stk.	105—107	..	2 16 1
700,000	50	12 June	7½	Grand Junction, 10 p.c. max.	120—124	..	3 0 6
295,000	Stck.	30 Sept.	4	Do. 4 p. c. Deb. Stk.	150—155	..	2 11 7
708,000	Stck.	13 Aug.	12	Kent	347—352	..	3 8 3
160,000	,,	,,	7	Do. New, 7 p. c. max.	217—222	..	3 3 0
1,043,800	100	26 June	7½	Lambeth, 10 p. c. max.	255—265	−5½	2 16 7
406,200	100	,,	7½	Do. 7½ p. c. max.	225—230	..	3 5 2
350,000	Stck.	30 Sept.	4	Do. 4 p. c. Deb. Stk.	148—153	..	2 12 3
500,000	100	13 Aug.	12⅛	New River, New Shares	428—433	−1	2 19 7
1,000,000	Stck.	30 July	4	Do. 4 p. c. Deb. Stk.	150—155	..	2 11 7
902,300	Stck.	12 June	4	S'thwk & V'xhall, Ordinary	154—159	..	2 10 4
126,500	100	,,	4	Do. Do. 7½ p. c. Max.	150—155	..	2 11 7
489,200	Stck.	,,	5	Do. Do. 5 p. c. Pref.	175—180	..	2 15 6
1,019,585	,,	30 Sept.	4	Do. 4 p. c. A Deb. Stk.	148—152	−3½	2 12 7
1,155,066	Stck.	12 June	10	West Middlesex	325—330	−3	3 0 7
200,000	,,	,,	4½	Do. 4½ p. c. Deb. Stk.	165—170	..	2 12 11

*Ex div.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—A continued increasing demand is reported for most descriptions of fuel; and pits are getting more nearly on to full time. Steam and forge coals meet with fair inquiry, and do not hang so much on the market as of late; but prices show no appreciable improvement. At the pit mouth, best Wigan Arley is fetching about 10s. to 10s. 6d. per ton; and Pemberton four-feet and seconds Arley, 8s. to 8s. 6d. The shipping trade, which has been considerably interfered with by the recent stormy weather, shows no material change. Fair inquiries are stirring; but the prices obtainable continue very unsatisfactory—7s. per ton being the full average for ordinary steam coal delivered at Mersey ports or on the Manchester Ship Canal.

Northern Coal Trade.—There is a slight improvement in the condition of the coal trade, due to the large arrivals of steamers for cargoes of coal, and also to the expectation of a better demand. The price for best Northumbrian steam coals varies from 7s. 9d. to 7s. 10½d. per ton f.o.b. In the gas coal trade, there is a very decided enlargement of the demand, and the price shows firmness. About 6s. 6d. to 7s. is still the quotation for best Durham gas coals; and there is less to sell, after the contract requirements have been met. Shipments were interfered with by the gales; but there is now a large quantity being sent out. In gas coke, there is no other alteration this week than the steady enlargement of the production.

Scotch Coal Trade.—There is still continued activity in all departments; but prices remain unchanged. Otherwise there is nothing else to record. The prices quoted are: Main, 6s. 3d.; and ell, 6s. 9d. to 7s. per ton f.o.b. Glasgow. The shipments for the week amounted to 159,937 tons—a decrease on the preceding week of 3343 tons, and on the corresponding week of last year of 3492 tons. For the year to date, the total shipments have amounted to 4,027,480 tons—an increase compared with the quantity in the same period last year of 236,879 tons.

New Water-Works for Rye.—The Rye Town Council have applied to the Local Government for power to borrow £1000 for erecting a new pumping-station at Cadborough, where a yield of an additional 21,000 or 22,000 gallons of water a day has been obtained.

The Position of the Bay State Gas Company.—The Money Article of the "Standard" yesterday contained the following remarks: "The news that the Bay State Gas Company of Massachusetts had gone into the hands of a Receiver had no influence on the price of its bonds here. It issued $7,000,000 of these bonds in London some years ago, through the agency of the Trustees, Executors, and Securities Insurance Corporation, Limited, and they never attained much favour with the investing public, as the price—80 to 85 for a 5 per cent. bond—sufficiently proves. The Company has a share capital of $5,000,000, and two other bond issues aggregating another $5,000,000. It represents an amalgamation of no less than fourteen gas companies, all supplying Boston with gas."

Reduction in Price.—The Leatherhead Gas Company have intimated to their customers that, from Sept. 30, the price of gas will be 4s. 6d. per 1000 cubic feet, or a net charge of 4s. for prompt payment; being a reduction of 3d.

Additional Storage for the Southborough Gas-Works.—Messrs. S. Cutler and Sons have obtained a contract for the erection of a telescopic gasholder, with anti-freezing apparatus, for the Southborough Gas-Works. Thirteen tenders were sent in; Messrs. Cutler's, for £965, being the lowest but one. The two highest were £1400.

New Gas-Works for Padiham.—The new site of 3¼ acres which adjoins the Lancashire and Yorkshire Railway will be laid out for works to produce 1 million cubic feet of gas per day, arranged in two sections of 500,000 cubic feet each. The necessary plans, &c., will be prepared by Mr. H. Simmonds, of Colne, whose services the Council have retained as Engineer.

Forthcoming Sale of Gas and Water Stock.—A favourable opportunity will be afforded, by the sale which Mr. Alfred Richards has announced for the 27th inst., for possessors of gas and water stock to give proof of their confidence in this class of investments by increasing their holdings, and for those who have not already acquired an interest therein to do so. The sale will include stock and shares of the capital value of £25,000, in the Brighton, Dorking, Eastbourne, Harrogate, Hastings, Sutton, and West Ham Gas Companies; the Aldershot and Barnet Gas and Water Companies; and the South-West Suburban Water Company. In the case of Aldershot, both debenture stocks and preference shares will be offered.

The Proposed Purchase of the Torquay Watersheds.—By a majority of 18 to 3, the Torquay Town Council have lately decided to promote a Bill in the next session of Parliament authorizing the Corporation to "increase and protect the water supply, and to purchase lands forming the watersheds at Trenchford and the storage reservoirs and streams at Kennick and Tottiford, from which such supply is obtained, including any water rights connected with such streams." Some objection was taken to the wording of the resolution. The Town Clerk stated, in answer to a question, that the Corporation already own 100 acres of land, including the storage reservoirs. Notwithstanding this, the resolution defines as one of the objects of the Bill the purchase of the storage reservoirs.

Exhibitions of Gas Appliances.—Messrs. Richmond and Co., Limited, have just concluded a series of five weeks' exhibitions in the New Brighton, Liscard, and Seacombe districts, under the auspices of the Gas Department of the Wallasey District Council, and they have been a great success—upwards of 150 cookers having been sold. An exhibition of gas appliances made by the London Fire Appliance Company, in accordance with the patents of Mr. W. B. Dick, was held at Gorebridge, Mid-Lothian, on two days of last week. The Gorebridge Gas Company promoted the exhibition. They have just reduced the price of gas from 5s. 8d. to 5s. 3d. per 1000 cubic feet, and have notified that if gas cookers and heaters are taken up by the community to a sufficient extent, they will further lower the charge.

RICHMOND & CO., LTD.,

WARRINGTON & LONDON.

THE "DRAGON."

New Pattern. Season 1896-7.

ADVANTAGES:

1. It is **very hot and incandescent** in a few minutes.
2. Most ornamental in design, and **beautifully finished.**
3. **New Duplicate Hot-Air Chamber joined by four tubes,** secures all duty possible from gas consumed, **giving 574 sq. in. of heating surface.**
4. Vaporizing pan at bottom of Stove **overcomes complaint of dry heat.**

PRICES.

1485	45s.
1487	55s.
1489	65s.

Explosions of Gas.—A serious explosion occurred last Tuesday morning at the Central Hotel, Isle of Man. About three o'clock, the neighbourhood was startled to hear the sound of a dull noise and of falling *débris*. It was discovered that a portion of the upper part of the Central Hotel had been blown away. It was then found that gas had been escaping on the landing, and becoming ignited, had completely devastated one of the bed-rooms. It is surmised that the escape was caused by rats. On the following morning, an explosion of gas happened at the Castle public-house, Leyton Road, Stratford New Town. It began near the bar, and almost wrecked the lower part of the house. William Gotobed, aged 21, the potman, was so seriously injured by glass, &c., that, on being taken to West Ham Hospital, it was deemed advisable to detain him as an in-patient for treatment.

Incandescent Gas Lighting at Croydon.—A report by the General Purposes Committee on the question of improved street lighting was presented at the meeting of the Croydon County Council yesterday week. It announced that the Croydon Gas Company expressed their willingness to extend the system of lighting by incandescent lamps as at present carried out in George Street, Park Lane, and Wellesley Road, upon the Corporation paying an additional sum amounting to about 4s. 3d. per lamp per annum, and contracting to use at least 500 incandescent lamps for a term of five years; the Company guaranteeing at least five times' greater illuminating power than by the ordinary burners. The Committee considered the Company's offer a reasonable one; and, subject to the agreement being for three in lieu of five years, they recommended that at present certain of the main thoroughfares should be so lighted. The report was adopted; and it was intimated that the Committee intended to approach the Crystal Palace District Gas Company as to the lighting of the portion of the borough within their area of supply.

The Chichester Corporation and the Purchase of the Water-Works.—The suggested purchase of the Chichester Water Company's Works by the Corporation came before the citizens at a public meeting held on the 4th inst., when the Mayor (Mr. E. Prior) stated that the proposal, if carried out, would result in a profit of nearly £400 a year. At the same time, he would not give such a price as £63,000 for the undertaking. Mr. C. Brown thought the matter should be submitted to the ratepayers, and a poll taken thereon; and he moved a resolution to this effect. An amendment was, however, proposed, urging the Town Council to oppose the purchase until an independent valuation of the works had been made; and this, after much discussion, was carried. The next day the Council again considered the matter. An opinion was expressed that the question should go to the ratepayers for settlement by a poll. A resolution was nevertheless proposed to sanction the promotion of a Bill; but, as at a former meeting, it failed to obtain the necessary majority in its favour. The Council's position is an extremely awkward one, as they are under agreement with the Water Company to introduce a Bill to authorize the acquisition of their property.

New Joint-Stock Companies.—The Port Erin and Port St. Mary Gas Company, Limited, has been formed with a capital of £6000, in £5 shares, to supply light in the village districts of Port St. Mary and Port Erin and elsewhere in the Isle of Man. The Killamarsh Gaslight and Coke Company, Limited, has been registered with a capital of £5000, in £1 shares. The Simon-Carvès Bye-Produce Coke-Oven Construction and Working Company, Limited, with a capital of £100,000 in £1 shares—(65,000 preference and 35,000 deferred) has been formed to negotiate for, and enter into, such contracts as may be necessary with Mr. Henry Simon, M.Inst.C.E., of Manchester, and the Société Anonyme de Carbonisation, in Paris, for the purchase of the goodwill of their business, as erectors or users of plant and ovens for the carbonizing of coal according to the Simon-Carvès method, or such other methods or principles as the Company may decide upon; to carry on business as tar and benzol distillers, manufacturing chemists, &c.; to acquire any patents, patent rights, and inventions; and to construct and maintain rail and tram roads, wharves, piers, docks, warehouses, gas, water, and electric works, &c. Among the signatories are MM. Pernolet and Letourneau, of Paris, Messrs. H. and E. Simon, of Manchester, and Mr. W. Schroller, of Durham.

The Extensions at the Oldham Gas-Works.—At the meeting of the Oldham Borough Council on the 7th inst., Mr. Harrop, referring to the extensions about to be made at the Hollinwood works, as mentioned last week, said in his opinion they were totally inadequate. The extra storage capacity was only 400,000 cubic feet, or an increase of 7 per cent.; while, according to the returns, there had been a continued increase in the consumption of gas equal to 13⅓ per cent. They would remember that in January last Hollinwood was in darkness. The increase now proposed would, under similar circumstances, only give at the most 1½ hours' extra light. They would not commence the work until February; and there was every probability that this winter they would be in a similar state to that in which they were last January. They had land at Bower Clough; and he suggested the erection of a large holder capable of containing 2 or 3 million cubic feet. This, he understood, would take two years to complete. What was to be done in the meantime? Mr. Shaw said he was surprised at the remarks of Mr. Harrop; and he asserted that no Committee could have done more than they had to meet the necessities of the case during the last six months. An incident such as happened last January was an exceptional one and might never occur again. The Mayor said, with regard to the erection of a holder at Bower Clough, it would prove very expensive indeed; and there would be other things to be taken into consideration besides the cost. As was known, the Committee had practically decided to put up water-gas plant at Hollinwood, which would be capable of being brought quickly into work at any time when there was a prospective deficiency, and would be able to supply all the requirements in that part of the town. The Committee's minutes were confirmed.

The Gas Supply of Vienna.—Telegraphing last Sunday night, the Vienna Correspondent of the "Daily Chronicle" said: "A stout fight of the Viennese against the Imperial Continental Gas Association will be brought to an end probably this week. The Town Council, which is properly the executive council of the Municipality, resolved yesterday unanimously to propose to the Municipal Council to erect gas-works of their own instead of purchasing works from the Association which has been lighting Vienna for upwards of 50 years. The contract renewed in 1875 stipulates that the town shall have the right of purchasing the works at a valuation. The works accordingly have been valued at about 16,000,000fl. The Municipality will have to declare its intention to purchase by the end of this month. The cost of erecting municipal works is estimated at not less than 30,000,000fl.; and it is more than doubtful whether there is time to build the works and lay the 545 miles of mains requisite for the capital by October, 1899, when the existing contract expires. The advantageous offers made by the Association have been so far rejected; the outcry of the present anti-Semitic majority being, 'Out with the English.' This cry is likely to cost the citizens dear, unless common sense is allowed to intervene at the eleventh hour. It is not easy to understand why upwards of 30,000,000fl. should be spent if the works can be had for 16,000,000fl.; but the hostility to foreign enterprise—and, in fact, to any enterprise in Vienna—of the anti-Semitic party exceeds the limits of reason. The technical advisers of the town are decidedly opposed to the scheme, as unfeasable and unreasonable. Large proportions of the business world have signed a protest against the wholesale breaking up of streets, which would render the traffic of the capital almost impossible in 1898, which is the Jubilee Year of the Emperor's reign."

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PATENT GAS EXHAUSTERS AND ENGINES.

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They have completed Exhausters to the extent of 32,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work.

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Also GIRARD and other TURBINES, HIGH SPEED ENGINES, DYNAMOS, &c., &c., for ELECTRIC LIGHTING.

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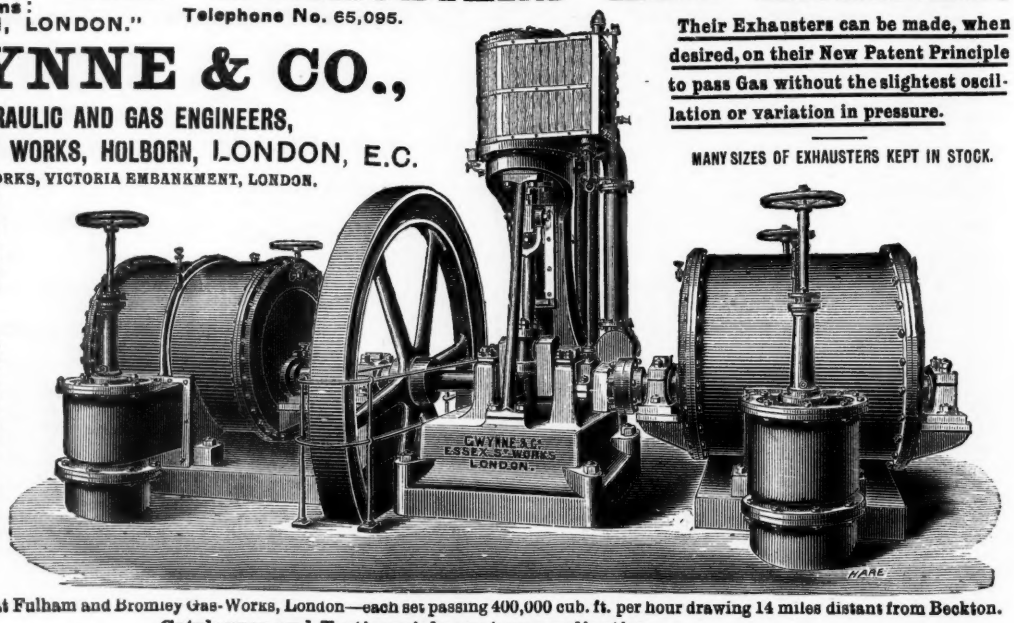

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Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS, should be received not later than the FIRST POST on SATURDAY.

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PREPARED from pure Iron.
Two or three times as rich as Bog Ore.
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To be used alone, but will increase activity of other Oxides.
Less than half the price of Bog Ore.
Can be lent on hire.
Write for tabulated results.
READ HOLLIDAY AND SONS, LIMITED, HUDDERSFIELD.

CAUTION—It has come to my knowledge that someone representing himself to be a relative, has been calling on my friends, and obtaining money by means of Cheques, on plain paper, purporting to be drawn by me on the London and Westminster Bank, Victoria Street, S.W. I have no Account at that Bank; have issued no such Cheques; and give this notice in order that my friends may not be imposed upon.
WILLIAM SUGG.
Oct. 17, 1896.

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[For Illustrated Advertisement see Oct. 6, p. 626.]

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For all Tar Joints.
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Please write for Estimate before ordering elsewhere.

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INCREASE the Efficiency of your PURIFIERS by adopting CRIPPS'S PATENT BYE-PASS VALVE in the lower Tiers of Sieves. Practical Experience proves their Economy. Engineers are repeating orders after thorough trial.
References and Particulars can be obtained from the Makers—
C. & W. WALKER, Midland Iron-Works, Donnington, near Newport, SALOP.
And J. EVERY & SON, Phœnix Iron-Works, LEWES.

It is Worth Your While to Buy
DIRECT.
THE RELIANCE LUBRICATING OIL COMPANY SUPPLY on APPROVAL "RELIANCE" NON-CORROSIVE LUBRICANTS (which, through their superiority, have the largest sale in the world)—viz., Engine, Cylinder, and Machinery Oils, 11½d.; Spindle Oil, 8½d.; Gas-Engine and Dynamo Oils, 1s. 6d. per gallon; Barrels Free and Carriage Paid. Also Liquids for Gas Making, Enriching, &c.
RELIANCE LUBRICATING OIL COMPANY, WATER LANE, GREAT TOWER, LONDON, E.C.
Depôts at Liverpool, Bristol, Hull, Glasgow and Newcastle-on-Tyne. Telegrams: "Subastral, London."

WANTED, a thoroughly efficient WORKING MANAGER for a small Gas-Works in a rising Town. Accustomed to Regeneratives.
State Age, Experience, Wages required, &c., to W. A. PADFIELD, Consulting Engineer, EXETER.

WANTED, a steady Man, as Main and SERVICE LAYER and METER REPAIRER. One with a knowledge of Smith work preferred. Wages 24s. per week.
Apply to the GAS MANAGER, Wilmslow, MANCHESTER.

JUNIOR Clerk wanted, with some know-ledge of Gas Company's Accounts and Double Entry. One who can write Shorthand, and use Typewriter preferred.
Apply, by letter in own handwriting, with *copies only* of Testimonials, to No. 2728, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, for a Provincial Gas-Works within 35 miles of London, a good trustworthy FOREMAN. Must be used to Regenerative Furnaces and the Management of Stokers and Yardmen. Make of Gas 180 Million cubic feet per year.
Applications (by letter), giving Age, Experience, and Salary required, with References or Testimonials, to be addressed to No. 2729, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS PURIFICATION.

OXIDE OF IRON BOG ORE.

BALE & CO.'S Oxide of uniform quality.
Sample and Price on application.
OXIDE PAINTS, OILS, SULPHURIC ACID, &c.
120 and 121, NEWGATE STREET, LONDON, E.C.
Telegrams: "BOGORE, LONDON."

OXIDE OF IRON.

FINEST Quality of Natural Bog Ore.
Particulars and price, apply to Mr. T. L. ARCHER, 20, Fennel Street, MANCHESTER.

PATENTS FOR INVENTIONS.

J. C. CHAPMAN, M.I.M.E. and Fel. Chartered Inst. Patent Agents. ADVICE ON ALL MATTERS CONNECTED WITH ABOVE.
Information and Handbook on application.
70, CHANCERY LANE, LONDON, W.C.

SULPHATE OF AMMONIA SATURATORS.

JOSEPH TAYLOR & CO., Chemical Plumbers, &c., and Makers of every description of Solid Plate Lead and Timber Cased Saturators, &c. CENTRAL PLUMBING WORKS, TOWN HALL SQUARE, BOLTON. Special Attention to Repairs.
Before placing Orders, please write for Estimate.

CANNEL, COAL, ETC.

JOHN ROMANS & SON, EDINBURGH, Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS and WATER WORKS.
Prices, &c., will be forwarded on application to No. 80, ST. ANDREW SQUARE, EDINBURGH, NEWTON GRANGE, NEWBATTLE, DALKEITH, } SCOTLAND.

In Paper Covers, Post Free 2s.

STEPHEN CARPENTER, late of the Bow Common Gas-Works, on the PURIFICATION OF COAL GAS BY LIME, &c., and the Method of Working Lime Purifiers so that the Lime may be used a second time, with a Description of a short Method of Working the Sulphur Test.
S. CARPENTER, "Ryde," Woodhouse Grove, East Ham, Essex; or of H. W. CARPENTER, 3, Bedford Villas, Carshalton, SURREY.

GAS-METER MAKERS.

MANAGER wanted, with thorough knowledge of Manufacture of Gas-Meters in all Branches. A liberal Salary, with Commission, Profits, and permanent Engagement to a really First-class Man.
Apply, by letter, to WRIGHT, BECKET, AND Co., Solicitors, 17, Water Street, LIVERPOOL.

MERTHYR TYDFIL GAS COMPANY.

ASSISTANT CLERK.

WANTED, a Young Man as Assistant CLERK. Must be Experienced in the Accounts of a Gas Office.
Applications, in own Writing, stating Age, Experience, and particulars of last Employment, and enclosing *copies only* of not more than three recent Testimonials, to be endorsed "Assistant Clerk," and addressed to the undersigned not later than Saturday, the 31st inst. Salary £78 per annum.
JOHN L. COCKER,
Secretary and General Manager.
Gas Offices: Gas-Works,
Merthyr Tydfil, Glamorganshire,
Oct. 15, 1896.

OIL-GAS BENZOL for Enriching Coal Gas. A few Thousand Gallons to dispose of.
Apply, by letter, in the first place, to No. 2714, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE—One Second-hand Station METER, capacity 6000 cubic feet per hour, with Four-Way Bye-Pass and Connections.
For Price, apply to the GAS MANAGER, Wilmslow, MANCHESTER.

FOR SALE, Wrought-Iron Annular CONDENSER—Eighteen Tubes, 20 feet by 2 ft. 4 in. diameter; 14-inch Inlets. In first-rate condition. Passing 1 million cubic feet per day. Price £150. Can be seen at work. Also STATION METER for 40,000 cubic feet per hour. Price £80. Both being replaced by larger.
Apply to JOHN CHEW, Gas Engineer, BLACKPOOL.

FOR SALE—Thirty Bray's Street LANTERNS, with Copper Tops, and 80-candle power Triplet Burners, with Bye-Pass for lowering to one 5-feet Burner during the night; and Two SUGG'S WHITEHALL LANTERNS and Triplet Burners, with Bye-Pass as above. The Lanterns have been removed for Public Improvements. The whole are in good condition, and fitted with Cradles for attachment to Columns.
Can be inspected at the Office of the DOVER GAS-LIGHT COMPANY, Russell Street, DOVER, where Offers are to be addressed on or before the 31st inst.; but the Company do not undertake to accept the highest tender.
Oct. 5, 1896.

IN consequence of a death, the Publisher has had placed in his hands for disposal a SET OF THE "JOURNAL," from Vol. I. to Vol. XLIII. bound, and the unbound Numbers for Vol. XLIV. The Books are in good condition, half bound, leather backs, paper sides; and Sample Volumes can be seen at the Office.

Offers for same to be addressed to No. 2725, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

A COMPLETE Gas Plant for Sale cheap. Also GASHOLDER, 45 ft. by 14 ft. PURIFIERS, sets of Four, 7 ft. by 4 ft.; 12 ft. and 14 ft. square; and two 8 ft. square. Kirkham WASHER-Engine and Pump EXHAUSTERS (Dempster's). ROTARY EXHAUSTERS; and other new and second-hand APPARATUS ready for delivery. Inquiries solicited.

J. F. BLAKELEY, Gas Engineer, Ravensthorpe, YORKS.

"JOURNAL OF GAS LIGHTING."

FOR SALE, Very Cheap—The Half- Yearly Volumes, 1885 to 1888 bound, 1889 to June, 1892, and July, 1895, to December, 1896, equal to new. Also (but without Indices) the Volumes for 1893 and the second Volume of 1892. Subscriber going abroad.

Address Dr. HARREVELD, Devanter, HOLLAND.

WIDNES CORPORATION GAS AND WATER WORKS.

GAS PLANT, &c., for Sale—Annular CONDENSER, MANN and WALKER TOWER SCRUBBER, 88 ft. by 8 ft., and a WALKER PURIFYING-MACHINE of 1 Million Cubic Feet capacity per diem. The Valves and Connections for the above are 12 inches diameter.

Particulars may be obtained on application to Mr. ISAAC CARR, Assoc.M.Inst.C.E., Gas-Works, WIDNES.

COMPLETE GAS PLANT FOR SALE.

TO BE SOLD separately, or in one lot—

One large Double-Lift HOLDER, with Cast-Iron Tank, 46 ft. 6 in. diameter by 16 ft. deep, with Inlet and Outlet Pipes.

Two Double-Lift HOLDERS, 34 ft. 4 in. diameter outer, 32 ft. 10 in. inner, 14 ft. 3 in. deep, with Pipes, &c.

One GOVERNOR, SYPHON BOXES, VALVES, &c.

One STATION METER, with Valves (new), Braddock's make.

One Set of four PURIFIERS, 7 ft. square by 4 ft. deep, Walker's make, with Grids and one of their Centre-Valves, Connections, and Lifting Gear.

One TAR-PUMP and STORE BOILER.

One Eclipse WASHER-SCRUBBER, Laycock and Clapham, with Pulleys and Governor, erected in 1890.

One EXHAUSTER, with 12-inch Valves and Connections.

One Horizontal CONDENSER, with fourteen 8-inch Pipes, 18 ft. long, with Bye-Pass, Valves, and Connections.

Twenty RETORT MOUTHPIECES, with Lids and Duplicates, Dip, Ascension, and Bridge Pipes, Hydraulic Main and Valve, Fire-Doors, Buckstaves, and Tie-Rods.

12-inch and 8-inch MAINS, at per ton.

12-inch VALVES, at each.

For further Particulars and Prices, apply to H. I. WILLIAMS AND CO., Kidsgrove, STOKE-ON-TRENT.

THE Birstall District Council are pre- pared to receive TENDERS for the purchase of the surplus TAR and AMMONIACAL LIQUOR (the latter at 4°, 4½°, 5°, 5½°, and 6° by Twaddel's Hydrometer respectively), made by them at their Gas-Works, Birstall, adjoining the L. & N.W. Railway, for One, Two, or Three Years.

Tenders, stating price per ton for each article, and for the Liquor at each strength, sealed and endorsed, must be sent to me not later than Monday, Nov. 2, 1896.

The successful Contractor will, at his own expense, have to enter into an Agreement and Bond with and to the Council for the due performance of his Contract.

The District Council do not bind themselves to accept the highest or any tender.

For further Particulars, apply at the Gas-Works, or to WM. MIDDLEBROOK, Solicitor, Clerk to the Council.

Council Offices: Birstall, near Leeds, Oct. 17, 1896.

CORPORATION OF LEICESTER.

RETORTS AND FIRE-BRICKS.

THE Gas and Electric Lighting Com- mittee of the above Corporation are prepared to receive TENDERS for the supply and delivery of RETORTS and FIRE-BRICKS.

Specification, Quantities, and Form of Tender can be obtained from the Engineer.

Tenders, addressed to Alderman Lennard, Chairman, and endorsed "Tender for Retorts, &c.," to be delivered at these Offices not later than Eleven o'clock a.m., on Saturday, Nov. 7, 1896.

The Committee do not bind themselves to accept the lowest or any tender.

ALFRED COLSON, M.Inst.C.E., Engineer and Manager.

Offices: Millstone Lane, Leicester, Oct. 17, 1896.

COKE-BREAKERS,

PRICES REDUCED.

(THOMAS & SOMERVILLE'S PATENT)

New Design, with two Cutting Rollers, making less Breeze than their old pattern.

GEORGE WALLER & CO.,

165, QUEEN VICTORIA STREET, E.C.,

And at STROUD, GLOUCESTERSHIRE.

SHEFFIELD UNITED GASLIGHT COMPANY.

EFFINGHAM STREET STATION.

TO GASHOLDER MAKERS, CONTRACTORS, &c.

THE Directors of this Company invite TENDERS for the addition of a THIRD LIFT, together with the necessary Alterations, to No. 3 Telescopic Gasholder, 150 feet diameter, at their Effingham Street Station.

Drawings and Specification may be seen, and Bill of Quantities with Form of Tender obtained, on application to the Company's Engineer, Mr. Fletcher W. Stevenson, on payment of 10s. 6d., which will be returned on receipt of a *bond-fide* tender.

Sealed tenders, endorsed "Tender for Enlarging Gasholder," addressed to the undersigned, must be delivered by post not later than the first post on Saturday, the 31st inst.

The Directors do not bind themselves to accept the lowest or any tender.

HANBURY THOMAS, General Manager and Secretary.

Commercial Street, Sheffield, Oct. 9, 1896.

FIRE-CLAY GOODS.

THE Directors of the Sheffield United Gaslight Company invite TENDERS for the supply of FIRE-CLAY GOODS (Retorts, Bricks, &c.), required for Repairs at their Neepsend and Effingham Street Stations during the next Twelve Months.

Specifications and Forms of Tenders may be had on application to the Company's Engineer, Mr. Fletcher W. Stevenson.

The Directors do not bind themselves to accept the lowest or any tender.

Sealed tenders, marked "Tender for Fire-clay Goods," addressed to the undersigned, must be delivered by post not later than the first post on Saturday, the 31st inst.

HANBURY THOMAS, General Manager and Secretary.

Commercial Street, Sheffield, Oct. 9, 1896.

SOUTH METROPOLITAN GAS COMPANY.

SALE BY TENDER OF £30,000 FIVE PER CENT. PERPETUAL DEBENTURE STOCK.

MINIMUM PRICE £172 PER CENT.

NOTICE is Hereby Given, that it is the intention of the Directors of this Company to SELL BY TENDER £30,000 of FIVE PER CENT. PERPETUAL DEBENTURE STOCK, in accordance with the Provisions of the South Metropolitan Gas Act, 1882.

Particulars of same, with Form of Tender, can be obtained at this Office, on application to the undersigned; and Tenders must be sent in on or before Saturday, the 31st day of October inst.

The Stock will be allotted to the highest bidders; but no tender will be accepted at a lower Price than at the rate of £172 money for each £100 Debenture Stock.

By order, FRANK BUSH, Secretary.

Offices: 709A, Old Kent Road, S.E., Oct. 17, 1896.

ISSUE OF STOCKS AND SHARES BY AUCTION UNDER PARLIAMENTARY POWERS.

MR. ALFRED RICHARDS undertakes the issuing by Auction of GAS AND WATER SHARES under Parliamentary Powers.

He also holds MONTHLY SALES of GAS AND WATER SHARES at the Auction Mart, Tokenhouse Yard, E.C.

Terms for the issuing of Capital, and also for offering to auction Gas and Water Shares, and all Particulars relating thereto, may be had of Mr. Alfred Richards.

Offices: 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the Aldershot Gas and Water Company, the Executors of the late James Moss, Esq., and others.

IMPORTANT SALE OF

DEBENTURE AND ORDINARY STOCKS AND SHARES

IN

GAS AND WATER COMPANIES.

MR. ALFRED RICHARDS will Sell by AUCTION at the Mart, Tokenhouse Yard, London, E.C., on Tuesday, Oct. 27, at Two o'clock precisely, in lots, the following High-class Investments:—

ALDERSHOT GAS AND WATER COMPANY—A new issue, by order of the Directors, of £4156 11s. 6d. Four per Cent. Perpetual Debenture Stock and 100 £10 Five per Cent. Preference Shares.

EASTBOURNE GAS COMPANY—Fifty-three £10 fully-paid "A" and "C" Shares (Dividends 14 per cent.).

HASTINGS & ST. LEONARDS GAS COMPANY—Twenty-three £25 Shares and 50 £20 Shares (Dividends 13 and 10 per cent.).

HARROGATE GAS COMPANY—£1200 "C" Stock (Dividend 13½ per cent.).

BRIGHTON AND HOVE GENERAL GAS COMPANY—£700 Original Ordinary Consolidated Stock (Dividend 11½ per cent.).

BARNET DISTRICT GAS AND WATER COMPANY—£236 "A" Stock, £10 "C" Stock, and £10 "D" Stock (Dividends 9 per cent. on the "A" and "C," and £6 6s. per cent. on the "D" Stock).

SOUTH-WEST SUBURBAN WATER COMPANY—186 £10 Five per Cent. Preference Shares.

WEST HAM GAS COMPANY—£600 Four per Cent. Perpetual Debenture Stock, 58 Original £5 Shares, and 60 £10 Shares (Dividends 9½ and 6½ per cent.).

DORKING GAS COMPANY—£159 Five per Cent. Perpetual Debenture Stock, seven £25 fully-paid "A" Shares, and five "C" Shares, £15 paid (Dividends 10 and 7 per cent.).

SUTTON GAS COMPANY—Twelve £10 Shares (Dividents 10 and 7 per cent.).

Full detailed Particulars may be obtained of Mr. ALFRED RICHARDS, Auctioneer, 18, Finsbury Circus, LONDON, E.C.

Just Published, Crown 8vo., Cloth, 5s. net.

INFLAMMABLE GASES:

The Detection and Measurement of Inflammable Gas and Vapour in the Air.

By Professor FRANK CLOWES, D.Sc.,

With a Chapter on PETROLEUM VAPOUR by BOVERTON REDWOOD, F.R.S.E.

London: CROSBY LOCKWOOD AND SON, 7, STATIONERS' HALL COURT, E.C.

JAMES OAKES & Co.,

ALFRETON IRON-WORKS, DERBYSHIRE,

AND

Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.,

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts and covers, and rendering leakage impossible.

LONDONDERRY GAS COALS

FROM THE

MARQUIS OF LONDONDERRY'S COLLIERIES,

COUNTY OF DURHAM.

Available output up to 5000 tons per day.
Yield of Gas 11,000 cubic feet per ton of Coal as per analysis by Mr. John Pattinson, F.C.S., F.I.S.

FOR PRICES AND PARTICULARS, APPLY TO

S. J. DITCHFIELD,

SEAHAM HARBOUR, COUNTY OF DURHAM.

HOLMSIDE GAS COALS.

PRESENT DAILY PRODUCE OVER 4000 TONS.

LATEST ANALYSIS—By CHARLES PHILLIPS, Gas Examiner to Rotherham Corporation.

Yield of Gas Per Ton. . 11,205 Cubic Feet.
Illuminating Power, $16\frac{7}{10}$ Stand. Sperm. Candl.
Coke (of good & pure quality) $13\frac{3}{4}$ Cwt. Per Ton.
Sulphur . . . . A little over 1 Per Cent.
Ash . . . . . Under 1 Per Cent.
Tar . . . . . 163 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor 103 Lbs. (Avoir.) Per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

SOUTH MOOR PELTON GAS COALS.

PRESENT DAILY PRODUCE AVAILABLE 2500 TONS.

RESULTS OF DIFFERENT ANALYSES:—

Yield of Gas Per Ton. . 10,500 Cubic Feet.
Illuminating Power . 17 Stand. Sperm Candl.
Coke (of excellent quality) . $13\frac{1}{2}$ Cwt. Per Ton.
Sulphur . . . . . 1·13 Per Cent.
Ash. . . . . 1·34 Per Cent.
Tar. . . . . 180 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor $94\frac{1}{2}$ Lbs. (Avoir.) Per Ton.

The HOLMSIDE and SOUTH MOOR COALFIELD possesses *a very great quantity of the best Coal*; and, whilst other Coal-Fields are becoming exhausted, this one is only being opened out, so that *the quality* of both the HOLMSIDE COALS, and the SOUTH MOOR COALS *may be relied upon for all practical purposes.*

These Coals may be bought through the Principal Merchants in England, or direct from

MR. MARK ARCHER,

HOLMSIDE AND SOUTH MOOR OFFICES,

NEWCASTLE-UPON-TYNE.

THE INCANDESCENT GAS-LIGHT COMPANY, LIMITED

— *v* —

"DE MARE" COMPANY.

THE INCANDESCENT GAS-LIGHT COMPANY, LIMITED.

— *v.* —

"SUNLIGHT" COMPANY.

THE INCANDESCENT GAS-LIGHT COMPANY, LIMITED, HEREBY GIVE NOTICE, as follows:—

VALIDITY. The Company's Patent has been declared VALID ON ALL POINTS after a Fifteen-Day Trial.

NATURE OF INVENTION. The Invention was described by Mr. Justice Wills as a "PIONEER INVENTION."

SCOPE OF PATENT. The Patent HAS BEEN GIVEN A WIDE CONSTRUCTION; and it was held that the protection given by it was not confined to Mantles manufactured according to the particular prescriptions set out in the Specification.

SHAPE OF MANTLE. The Judge held that a Mantle, even if made in a different form or shape (such as the "De Mare" Fringe or Plume), IS STILL AN INFRINGEMENT of the "Welsbach" Patent.

"DE MARE" JUDGMENT. Judgment for an INJUNCTION, WITH FULL COSTS, has been given against the "De Mare" Incandescent Gas-Light System.

"SUNLIGHT" JUDGMENT. Judgment was given AGAINST the "Sunlight" Incandescent Gas-Lamp Company, Limited, on the question of the VALIDITY OF THE PLAINTIFFS' PATENT.

"SUNLIGHT" MANTLES. Last about 100 hours.

"WELSBACH" MANTLES. Last about 1000 hours.

"Sunlight" Mantles BURN DOUBLE THE GAS to produce the same candle power as the Incandescent Gas-Light Company's Mantles.

Users of "Sunlight" Mantles are applying to the Incandescent Gas-Light Company to REPLACE THEM BY THEIR OWN MANTLES.

WARNING. Users of the Incandescent Gas-Light Company's Mantles upon "Sunlight" Burners ARE INFRINGERS OF THE COMPANY'S PATENT, AND WILL BE AT ONCE PROCEEDED AGAINST.

COSTS. Certificates of the Validity of the Company's Patent have been granted both by Mr. Justice Romer and Mr. Justice Wills entitling the Company to Solicitor and Client Costs, which will, IN ALL CASES, BE RIGOROUSLY ENFORCED.

INFRINGERS. The Incandescent Gas-Light Company WILL TAKE PROCEEDINGS AGAINST ALL PERSONS INFRINGING THEIR PATENT WHETHER MAKERS, WHOLESALE DEALERS, RETAILERS, or USERS.

Users of the Company's Mantles upon Burners not sold by the Company ARE INFRINGERS.

"LIMITED LICENSE" WARNING. Judgments have already been obtained against such users from Mr. Justice Chitty, Mr. Justice Stirling, Mr. Justice Kekewich, and Mr. Justice North.

FAITHFULL & OWEN,
11, Victoria Street,
Westminster.
Solicitors to the Incandescent Gas-Light Company, Limited.

April, 1896.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for

CANNEL & COAL.

TYNE
BOGHEAD
CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

EAST PONTOP
GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	17·8 candles.
Coke	70 per cent.

SOUTH PELAW MAIN
GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	73·1 per cent.

For Prices and complete Analysis, apply to

THOS. W. DANCE & SONS,
COAL OWNERS, NEWCASTLE-ON-TYNE
OR
E. FOSTER & CO.,
12, JOHN STREET, ADELPHI, LONDON, W.C.

HEBBURN MAIN GAS COALS.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·4 candles.
Coke	68 per cent.

For Prices, f.o.b. Ship or Delivered by Rail, apply to

THE WALLSEND & HEBBURN COAL COMPANY, LTD.
B Lombard Street,
NEWCASTLE-ON-TYNE.
W. RICHARDSON, Fitter.

THE SILICA FIRE-BRICK
COMPANY,
OUGHTIBRIDGE, near SHEFFIELD,
MANUFACTURE
SILICA BLOCKS,
BRICKS, AND CEMENT
OF SUPERIOR QUALITY
FOR GAS-FURNACES.

Trade Mark: "SILICA."

These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their
GREATER DURABILITY,
Strongly recommended where EXCESSIVE HEATS have to be maintained.

THOMAS TURTON
AND SONS, LIMITED,
SHEAF WORKS, SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.
SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS,
ANVILS, VICES,
AND ENGINEERS' TOOLS GENERALLY.
LONDON OFFICE:
90, CANNON STREET, E.C.

BOLDON GAS COALS.
Worked by THE HARTON COAL CO., LTD.
Output about 3000 tons per day.

ANALYSIS—

Yield of Gas per ton	10,500	Cubic Feet.
Illuminating Power	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

Boldon Gas Coals are supplied under contract to

The Gaslight and Coke Company, South Metropolitan Gas Company, Commercial Gas Company, Imperial Continental Gas Association, European Gas Company, L'Union des Gaz (the Continental Union Gas Company), Crystal Palace District Gas Company, Danish Gas Company, Bombay Gas Company, San Paulo Gas Company, Alliance and Dublin Consumers' Gas Company, Ipswich Gaslight Company, Newcastle Gas Company, Sunderland Gas Company, South Shields Gas Company, and to many other Companies at Home and Abroad.

For Prices, &c., apply to the
HARTON COAL COMPANY,
LIMITED,
Newcastle-on-Tyne.
W. H. PARKINSON,
FITTER.

TROTTER, HAINES, & CORBETT,
Brettell's Estate
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
Proprietors of
BEST GLASSHOUSE POT & CRUCIBLE CLAY.
Shipments Promptly and Carefully Executed.

London Office: R. Cull, 34, Old Broad St., E.C.

NEWBATTLE CANNEL.
Highest Results in Gas, & Excellent Coke.
QUOTATIONS ON APPLICATION TO
THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

UNEQUALLED.
Gas Companies are solicited to try Samples of the
MIRFIELD
BLACK BED GAS COAL.
Prices and Analysis on application.
MIRFIELD (GAS-COAL) COLLIERY COMPY.
RAVENSTHORPE, NEAR DEWSBURY.

The Cheapest House in the Trade for
LEVER LOCKS
FOR
GAS-METERS.
Joseph Oakley & Co.
Excelsior Works,
WILLENHALL.

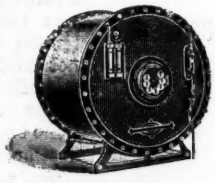
THORNLEY GAS COALS
WORKED BY THE
WEARDALE IRON & COAL Co., Ld.
OUT OF THEIR
THORNLEY AND WHEATLEY HILL COLLIERIES.

Analysis made by
Messrs. J. & H. S. PATTINSON, *May 28, 1895.*

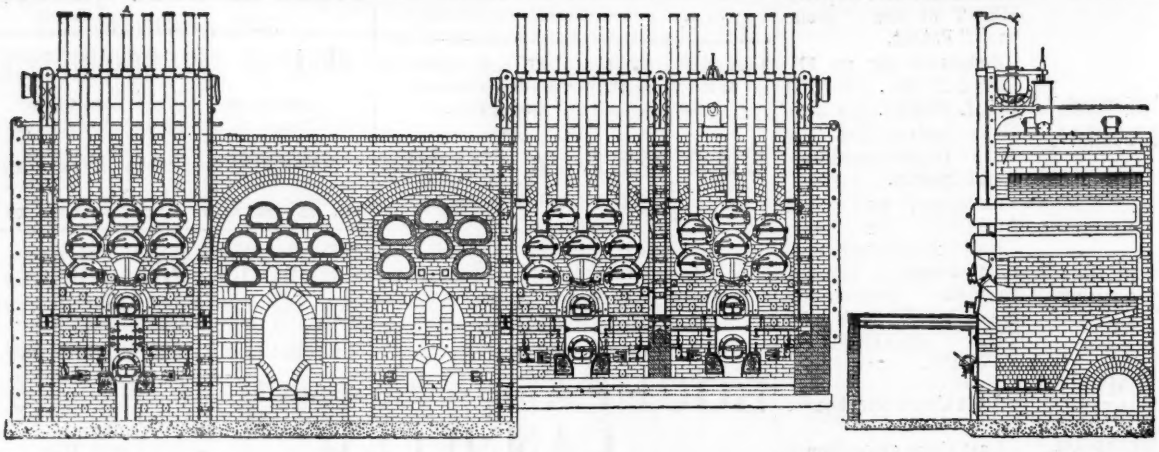
Yield of Gas per Ton	10,500 Cub. Ft.
Illuminating Power	16·9 Candles.
Coke (of good quality)	67·5 per Cent.
Sulphur	0·58 ,,
Ash	2·73 ,,

For Price, &c., apply to the
WEARDALE IRON & COAL Co., Ld.
QUAYSIDE, NEWCASTLE-ON-TYNE.

JAMES MILNE & SON, LTD.,
GAS ENGINEERS,
MILTON HOUSE WORKS, EDINBURGH.
LONDON. — GLASGOW. — LEEDS.



HISLOP'S PATENT REGENERATIVE SETTINGS OF GAS-RETORTS.



THESE SETTINGS ARE POSITIVELY UNRIVALLED IN PRODUCTIVE CAPACITY, DURABILITY, AND SIMPLICITY OF MANAGEMENT. RETORTS OF ORDINARY DIMENSIONS CARBONIZING FROM 18 TO 24 CWT. OF ENGLISH AND 21 TO 26 CWT. OF SCOTCH COAL PER 24 HOURS, DEPENDING UPON THE NATURE OF THE COAL, AND PRODUCING UP TO FULLY 13,000 CUBIC FEET PER MOUTHPIECE IN THE SAME TIME, AND WITH THE SMALLEST EXPENDITURE OF FUEL ATTAINABLE, AND RETURNING IN PROFIT THE ENTIRE COST OF ERECTION WITHIN TWELVE TO EIGHTEEN MONTHS; AND THUS REDUCING TO INSIGNIFICANCE THE INCREASED COST OF THESE SETTINGS OVER THE COMMON OR GENERATOR FURNACE SYSTEMS.

THESE SETTINGS ARE EXTENSIVELY ADOPTED, AND ARE ERECTED UPON THE SHALLOW AND STAGE FLOOR PLANS. THEY ARE ADAPTED TO ANY EXISTING ARRANGEMENTS, AND PERFECT SATISFACTION GUARANTEED. THE COMPOSITION OF FIRE-RESISTING AND OTHER SPECIAL FIRE-CLAY MATERIALS FURNISHED IS OF THE HIGHEST ORDER; AND THE SYSTEM AS A WHOLE, AS NOW PERFECTED, IS THE RESULT OF LONG EXPERIENCE AND CAREFUL STUDY OF THE PRINCIPLES OF GASEOUS FIRING.

Drawings and Tenders are furnished for the complete erection of Benches, including Retort and Bench Mounting of the most modern and approved description; or existing Ovens fitted up with the Patentee's arrangements.

Full Particulars may be had on application to the Patentee's Agents: **Messrs. JONAS DRAKE AND SON,** Retort Setters and General Carbonizing Engineers, Ovenden, Halifax, Yorkshire, Sole Agents for England, Wales, and Foreign Countries; **C. M. HAMILTON,** Retort Setter and Contractor, 5, Stuart Street, Shawlands, Glasgow, Agent for Scotland and Ireland; and to the Principal Agent, **R. F. HISLOP** (Son of Patentee), General Constructing and Carbonizing Engineer, Gas-Works, Paisley, N.B.

HISLOP'S PATENT HYDRAULIC MAIN SEAL-REGULATING AND TAR-EXTRACTING VALVE is a *Sine qua non.*
TO THE SATISFACTORY WORKING OF THE HYDRAULIC MAIN UNDER THE REGENERATIVE AS WELL AS OTHER SYSTEMS OF RETORTS. BEING LARGELY ADOPTED AND AFFORDING THE HIGHEST SATISFACTION.
The Patentee's SELF-SEALING CAPS FOR THE TOP OF ASCENSION-PIPES, and his "SPECIAL" FLUE PORT BOXES, are most important additions to his Carbonizing Plant.

SPENT LIMES NO LONGER WASTE PRODUCTS.
Under G. R. HISLOP'S Patents, all Spent Limes are effectively recovered at from one-third to one-half the cost of New Lime.
Further Information and Pamphlets from Principal Agent.

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Have constructed their EUROPEAN type of

CARBURETTED WATER-GAS PLANT

At the following Gas-Works:—

Copenhagen	700,000 Cub. Ft.	Brighton	1,500,000 Cub. Ft.
Belfast	1,700,000 „	Preston	1,500,000 „
Glasgow	300,000 „	Southport	750,000 „
Brussels	700,000 „	Bath	1,000,000 „
Liverpool	3,500,000 „	New York	1,200,000 „
Tottenham	750,000 „	Newburgh, N.Y.	350,000 „
Santiago	400,000 „	Tottenham (Second Contract)	750,000 „
Swansea	750,000 „	St. Joseph, Mo.	750,000 „
		Brussels (Second Contract)	700,000 „

And have now under Contract:—

Belfast (Second Contract)	4,500,000 Cub. Ft.	Stockport	500,000 Cub. Ft.
Shanghai	225,000 „	Norwich	1,000,000 „
Winchester	200,000 „	Guildford	350,000 „
Hoylake	125,000 „	Syracuse, N.Y.	850,000 „
Manchester	3,000,000 „	Bordentown, N.J.	125,000 „
Holyoke, Mass.	600,000 „	Lea Bridge	350,000 „
Edinburgh	2,000,000 „	Newburgh, N.Y. (Second Contract)	250,000 „
Stockton-on-Tees	500,000 „	Coventry	600,000 „

In addition to which the previous Installations of The Gaslight and Coke Company under this System have a total capacity of 10,000,000 cubic feet per diem.

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The latter being the Highest Award for Dry Gas-Meters at the Paris Exhibition, 1867. Since then we have not Exhibited FOR PRIZES.

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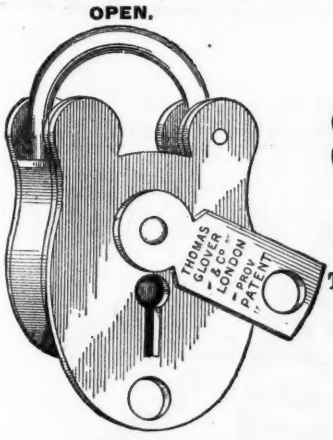

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SECURE PADLOCK

Prevents Tampering with the

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The Padlock is Sealed by means of a Lead Eyelet, which is impressed with Company's private mark. Eyelets easily fixed and removed by Company's Collector.

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Established 1860.

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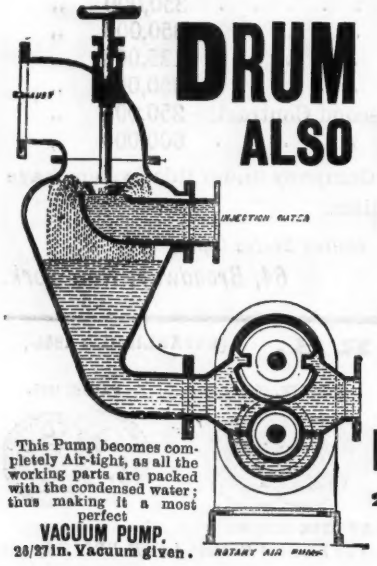
"The Force of the Piston Pump with the Capacity of the Centrifugal combined."
JOHNSON'S PATENT
DRUM PUMP AND EXHAUSTER
ALSO VACUUM PUMP AND CONDENSER.



This Pump becomes completely Air-tight, as all the working parts are packed with the condensed water; thus making it a most perfect
VACUUM PUMP.
28/27in. Vacuum given.

No Priming, Valves, or Frictional Working Parts.

The Pump of the future for quickly and economically moving large Bodies of Water, Semi-fluid, &c.

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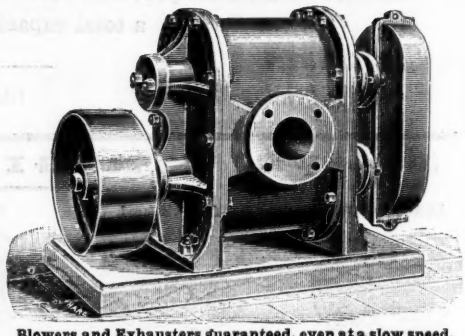

Blowers and Exhausters guaranteed, even at a slow speed, to give a working pressure of 3 lbs. and upwards, and this without losing power by creating frictional Heat.

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RETORT BENCHES ERECTED COMPLETE WITH OR WITHOUT SPECIAL FURNACES.
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ECONOMICAL, EFFICIENT, SATISFACTORY.

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Successful results guaranteed in all Situations.

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Analysis: 12,600 Feet of 19-Candle Gas per Ton.

Value in Pounds of Sperm, 820·80.

VERY FREE FROM IMPURITIES.

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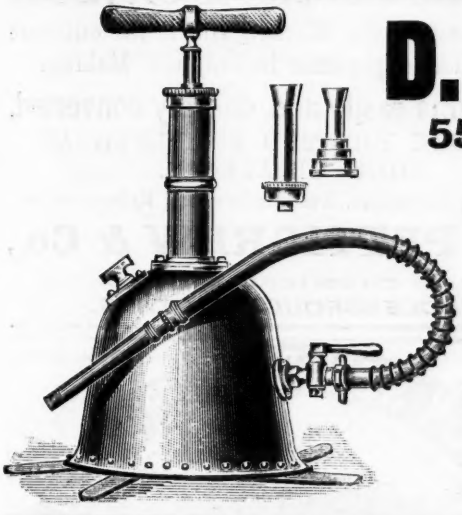

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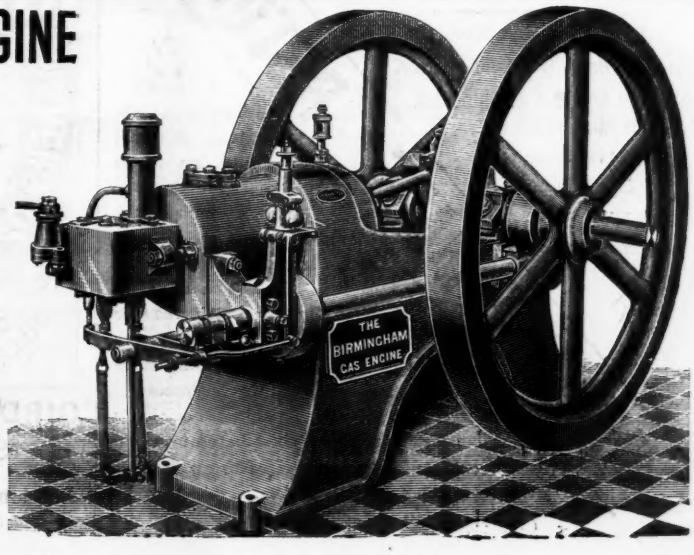
A thoroughly reliable Engine for Commercial or Electric Lighting Purposes. Simple, Strong, Interchangeable.

Adopted by the Corporation of Birmingham Gas Department for Driving the Conveyors at their Swan Village Works.



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A 280-CANDLE POWER
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CLASS A— **55/-**
LIGHT for LIGHT
less than half the price of any other Regenerative Lamp.
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Victory over Welsbach Incandescent Light.

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BEST QUALITY.

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[See Illustrated Advertisement, Oct. 6, p. 663.]

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NATURAL BOG ORE FROM OWN MINES.

Samples and Prices on application.

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12,100,000 CUB FT CAPACITY.
COMPLETED IN 12 MONTHS
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CHARGING OR COAL MEASURING TRUCKS.

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Patent Automatic Machinery

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Full Particulars may be obtained from the Sole Makers,

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[See Illustrated Advertisement, Oct. 6, p. 668.]

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PATENT MECHANICAL CONDENSER.

Over 292,000,000 Cubic Feet of Gas per Day is passing through about 550 of these Machines.

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HAVE PLEASURE IN ANNOUNCING THAT THEY HAVE MADE ARRANGEMENTS WITH THE

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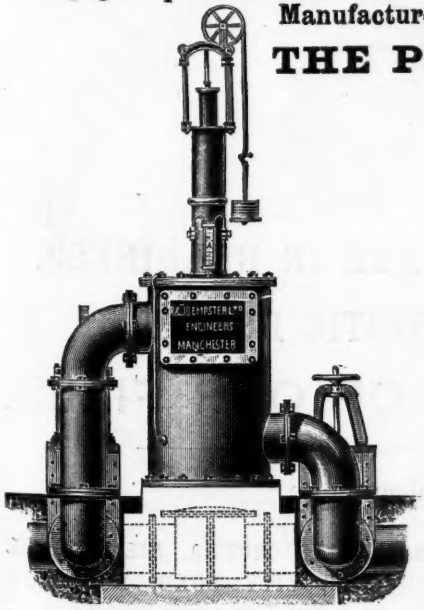
THE PELOUZE & AUDOUIN CONDENSER,

According to P. AUDOUIN'S LATEST PATENTS.



FRONT ELEVATION.

This Apparatus is in very general use in most of the Gas-Works on the Continent and in America; over **550** being in use in different parts of the World for condensing and arresting all Tar Particles and Vapours from the Gases from Coal, Oil, and Wood.

The large number in use is sufficient proof of its utility. By the almost complete elimination of Tar, which is effected to the extent of 99·7 per cent., it facilitates Purification in the Purifiers, by preventing the clogging or obstruction of the Purifying Materials, which, in consequence, last much longer; thus effecting a Saving both in Materials and Labour.

So effective is this Apparatus that a piece of white paper placed over a Test-Tap on the Inlet of the Machine is immediately covered with Tar, whilst on the Outlet the white paper remains perfectly clean.

The Machines are made in the following sizes, for Works producing per 24 hours—

	Cubic Feet.		Cubic Feet.
0	35,000	5	500,000
1	70,000	6	700,000
2	140,000	7	1,240,000
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For Prices and further Particulars, apply to the Sole Makers—

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ALL OUR GAS-FIRES ARE FITTED WITH OUR

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[See also Advt. p. 732.

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